ENGINEERING AND MINING JOURNAL

A McGRAW HILL PUBLICATION

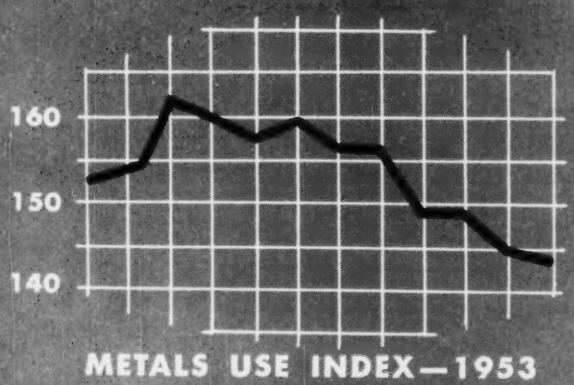
FEBRUARY 1954

PRICE ONE DOLLAR

FOUNDED 1866

From the Crises in '53—

A Challenge in '54



METALS USE INDEX—1953

85th Annual Survey And Outlook

TO EACH HIS OWN

in pumping abrasives

If you want

maximum head

and ability to work in series

▼

HYDROSEAL

Because Hydroseals maintain their initial efficiency up to the point when Maximix Rubber replacements are needed, oversize pump and motor allowance for wear is never required. Thus, power costs are cut 1/3 to 1/2.

Write for Hydroseal Catalog No. 953.

If you must pump

WITHOUT gland water

▼

CENTRISEAL

Industrially efficient in moving abrasives, corrosives, and acids where pulp must be delivered undiluted or sealing water is unavailable. Mechanical parts are interchangeable with anti-friction bearing Hydroseals.

Write for Centriseal Brochure No. 853.

Both Hydroseals and Centriseals are Maximix Rubber protected

THE ALLEN-SHERMAN-HOFF PUMP CO.

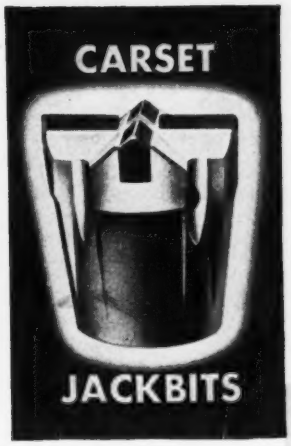
Dept. B—259 E. Lancaster Ave., Wynnewood, Pa.

Representatives throughout the World

HYDROSEAL *and* **CENTRISEAL**

SAND, SLURRY & DREDGE PUMPS

MAXIMIX RUBBER PROTECTED



A SIZE TO FIT EVERY NEED

try them on **YOUR OWN** thread connection

SERIES 100 RODS

SERIES 116 & 119 (H & D) RODS

TYPE 0, 1, 2 & 3 RODS

now better than ever

- **BETTER CARBIDE**
- **BETTER STEEL**
- **BETTER PERFORMANCE**

for example

A Large Eastern Mine Now Gets

OVER 500 ft. PER BIT

with their new Carsets

. . . they used to be satisfied with 250!

When this Company started using Carset Jackbits, 250 feet of hole per bit was quite an impressive record.

Today, they expect over 500 feet per bit.

Better footage means a *better bit.* And this increase – *double* the earlier records – reflects the important improvements that have been made in Ingersoll-Rand Carset Jackbits. Improvements that make them the hardest, toughest, longest lasting bits obtainable.

Now you can get I-R Carset bits in 14 gauge sizes, from *1¼* to *3½* inches. And you can use them *on your own rods.*

Order a trial lot today, or ask your I-R representative to arrange for a demonstration. The results will speak for themselves.

Ingersoll-Rand
11 BROADWAY, NEW YORK 4, N. Y.

957-15

ROCK DRILLS • AIR TOOLS • DIESEL AND GAS ENGINES
COMPRESSORS • CENTRIFUGAL PUMPS • VACUUM EQUIPMENT

ENGINEERING AND MINING JOURNAL

88th YEAR OF PUBLICATION

VOL. 155 NO. 2

FEBRUARY 1954

85th Annual Survey and Outlook

EDITORIAL 71

METALS

Gold 72
Silver 76
Copper 78
Lead 80
Zinc 82
Uranium 86
Titanium 87
Aluminum 88
Magnesium 90
Tin 91

MINOR METALS 92

Antimony 92
Beryllium 93
Mercury 94
Arsenic 94
Bismuth 95
Cadmium 95
Platinum Group 96

FERROALLOYS 97
Tungsten 97
Molybdenum 98
Manganese 99
Nickel 100
Cobalt 101
Chromium 102

NON-METALLIC

Sulphur 103
Fluorspar 104
Potash 105
Perlite 106
Barite 107
Phosphate 108
Asbestos 110
Mica 112
Feldspar 112

MINING 113
EXPLORATION 118
ORE DRESSING 120
IRON ORE 123
METALLURGY 126

Why the Industry United on Tariffs ..... Otto Herres 129

Regular Departments

New Products Digest 35
Outlook 67
Markets 68
Behind The By-Lines 70
Washington Impact 142
Personal News 150

This Month in Mining 156

Alfred M. Staehle ..... Publisher
Robert H. Ramsey ..... Editor

Alvin W. Knoerr, Managing Editor
Hans H. Wanders, Market Editor
John H. Kearney, News Editor

A. H. Hubbell, Senior Associate Editor
George H. Cleaver, Assistant Editor, Markets
George J. Young, Consultant

John B. Huttl, Associate Editor, San Francisco
F. Alvin Zimmerli, Assistant Editor, Layout
McGraw-Hill Washington Bureau

Morton A. Reichek, Natural Resources
George P. Lutjen, Associate Editor
Daniel P. Eigo, Copy Editor
Alan E. Adams, Labor

Carl Coash, Advertising Sales Manager

Published monthly by McGraw-Hill Publishing Co., Inc. James H. McGraw (1860-1948), Founder.

Publication Office, 1309 Noble St., Philadelphia 23, Pa. Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 West 42nd St., New York 36, N. Y. Donald C. McGraw, President; Willard Chevalier, Executive Vice President; Joseph A. Gerardi, Vice President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice President, Publications Division; Ralph B. Smith, Vice President and Editorial Director; Nelson Bond, Vice President and Director of Advertising; J. E. Blackburn, Jr., Vice President and Director of Circulation.

Subscriptions: Address correspondence to Engineering and Mining Journal—Subscription Service, 1309 Noble St., Philadelphia 23, Pa., or 330 West 42nd St., New York 36, N.Y. Allow one month for change of address.

Subscriptions are solicited only from management, production and maintenance executives and engineers in the metal and nonmetallic mining and refining industry. Position and company connection must be indicated on subscription orders.

Branch Offices and District Managers: Atlanta 3, R. H. Sidur; Chicago 11, F. W. Rosts, O. A. Mack; Cleveland 15, W. M. Spears; Dallas 1, J. H. Cash; Los Angeles 17, C. W. Dysinger; New York 36, T. E. Alcorn, John B. Lewis; Pittsburgh 22, H. C. Chellson; Philadelphia 3, W. A. Potter; St. Louis 8, F. W. Rosts; San Francisco 4, J. W. Otterson; Washington 4, D. C. London address: McGraw-Hill Publishing Co., Ltd., McGraw-Hill House, 95 Farringdon Street, London E. C. 4, England. Cable address: McGraw-Hill, London.

News Bureaus: Atlanta 3; Cleveland 15; Detroit 26; Houston 25; San Francisco 4; Washington 4.

World News Offices: London, Frankfurt, Manila, Mexico City, Paris, Sao Paulo, Tokyo.

Price of this issue $1. Subscription rates: United States and possessions, $3 a year, $4 for 2 years, $5 for 3 years. Canada, $5 a year, $8 for 2 years, $10 for 3 years. Other Western Hemisphere, $5 a year, $12 for 2 years, $16 for 3 years. Elsewhere, $15 a year, $25 for 2 years, $30 for 3 years.

Please indicate position and company connection in all subscription orders.

Entered as second class matter May 24, 1951, at the Post Office at Philadelphia, Pa. under the Act of March 3, 1879.

Copyright 1954 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved. Printed in U.S.A.

LETTERS TO THE EDITOR

'Wanted—A Mineral Policy'

. . . Ease The Tax Burden

SIR:

In your November 1953 editorial ("Wanted—A Mineral Policy") you ask, "What policy would you recommend if you were Secretary McKay?"

I would recommend a change in income tax laws as they relate to mining (to) restore an active . . . industry without . . . tariff increases. Double taxation of corporation profits and dividends and the so-called "excess profits tax" have much to do with abandoned mines (and even whole districts). These are especially detrimental to small mining operations, which formerly provided a large (part of metals production).

Another problem is to increase the productivity of labor, which has decreased in recent years.

(Also) the restoration of the right to own gold and to sell it on foreign markets. The restoration is really a fundamental right, (and) would benefit the whole country, as well as the mining industry. If this change is not made, the dollar's (inflationary course) will continue.

FRED H. DAKIN
Burlingame, Calif.

. . . Monetized Non-Ferrous?

SIR:

. . Your request for suggestions . . prompts me to offer the following: Why . . not monetize all of the nonferrous metals, and other strategic minerals and materials, which can be stored indefinitely in open lots or inexpensive warehouses without substantial loss or deterioration.

It is reasonable to assume that monetization could result in a profit over and above the cost of handling when increased demand (advances) prices. Federal government . . (could) purchase the items through an issue of Federal Reserve Notes (and) retire the notes (when the materials are withdrawn from the stockpile).

If we were to monetize such commodities. . . I can see no reason why we should be concerned over (how much such) material we accumulate. Such materials are real wealth.

BEN G. GELLENBECK
Tacoma, Wash.

. . . Preserve Our Economy

SIR:

On your editorial (November 1953) "Wanted—A Mineral Policy."

In all debates (on the feasibility) of depressing the domestic mineral producing industry, there are few expositions which disclose the impact on Federal revenue; . . . notwithstanding that our national economy is as important as any military engagement.

(Continued on page 216)

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

After two million tons, a new job for this cord belt

THAT'S just one section of the 3300-foot conveyor system on the Folsom Dam project. A series of belts, like a bucket brigade, deliver 550 tons of aggregate an hour from bunkers across a river to the cement batch plant you see in the background.

In choosing the belts, engineers knew the ordinary type could not handle the entire job because of the sharp 139-foot lift up to the screening tower. They needed a belt that was strong, yet flexible for the long, steep climb, so a B. F. Goodrich *cord* belt was selected.

This B. F. Goodrich belt is made of plies of parallel cords that run lengthwise. Each cord is completely surrounded by rubber—no cross threads tie them together. The parallel cords supply the extra strength, yet are flexible so that troughing is natural, belt keeps centered on idlers, spillage is held to a minimum.

And because of the cord belt's ability to withstand impacts, cutting, and heavy loads, the belt in the picture is expected to carry the 2,000,000 tons needed here, and then be moved to another construction site for many more years of useful service.

Your B. F. Goodrich distributor can tell and show you why BFG cord belts are able to give you this kind of service consistently (not just once in a while) in quarries, ore mines, and on construction jobs where severe operating conditions require the best and most modern conveyor belt construction for the most dependable, economical performance. *The B. F. Goodrich Company, Dept. M-181, Akron 18, Ohio.*

B.F.Goodrich
INDUSTRIAL PRODUCTS DIVISION

WINTER STARTS MADE EASY...

Keep Old Man Winter's stiffening hand off your mine car wheels. Use *Texaco Olympian Grease* to assure in cold weather easy, dependable starts.

Designed for all-year service, *Texaco Olympian Grease* stays in bearings—plain, cavity-hub or anti-friction — seals out dirt and moisture. Longer bearing life, lower maintenance costs result. *Texaco Olympian Grease* has strong resistance to oxidation — will not separate in use or in storage. Available in three consistencies.

On wire rope and open gears, use *Texaco Crater*. Wire rope stays strong longer because *Texaco Crater* surrounds the core and the strands with an enduring, protective coating. On open gears *Texaco Crater* clings to teeth, minimizing wear and noise. For extra convenience, use *Texaco Crater X Fluid*. Easily applied as a liquid, it stays on as a tough, wear-resistant lubricating film.

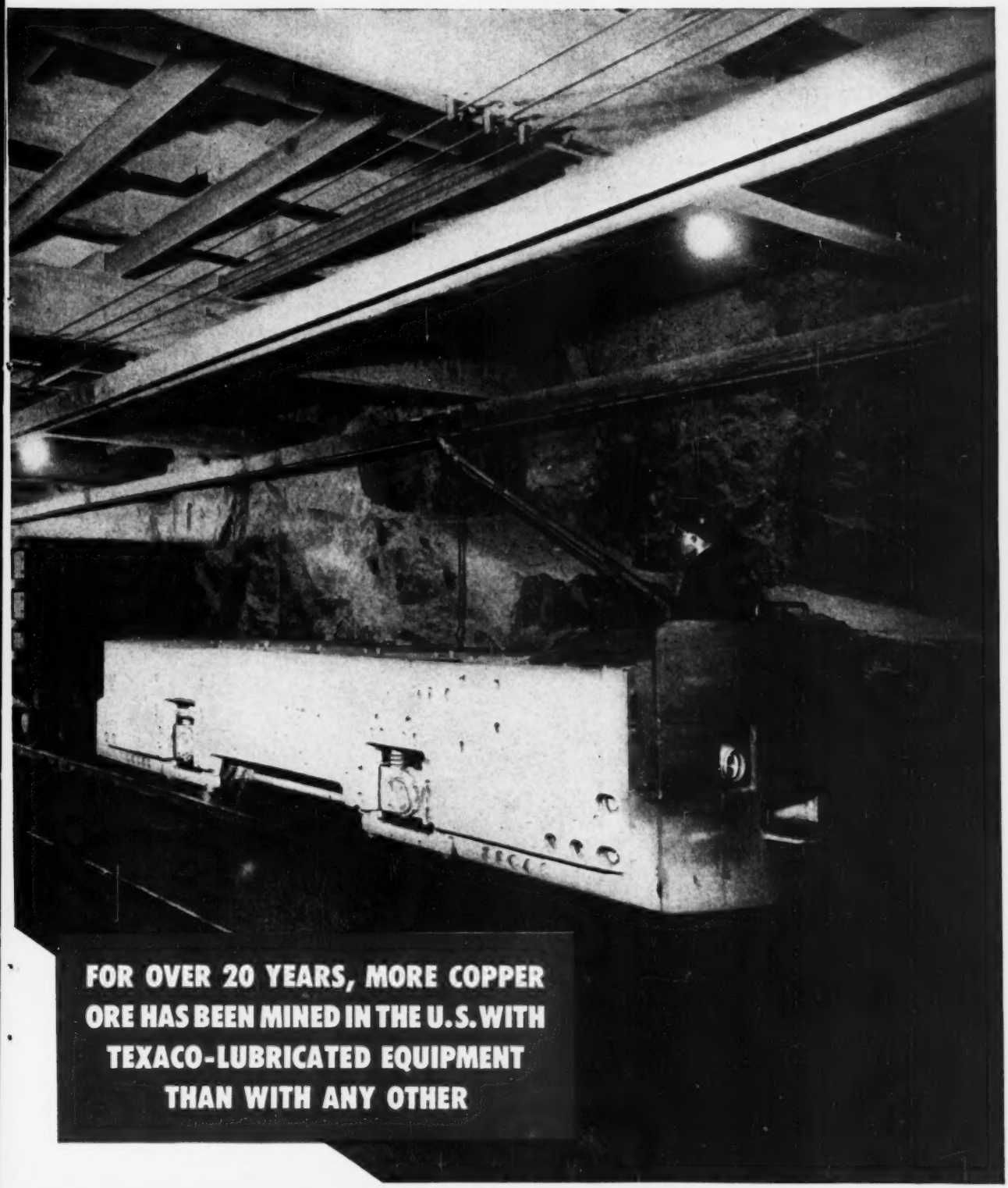
Let a Texaco Lubrication Engineer help you cut costs quickly. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TUNE IN:
METROPOLITAN OPERA
radio broadcasts
every Saturday afternoon.
See newspaper for
time and station.

TEXACO

TEXACO

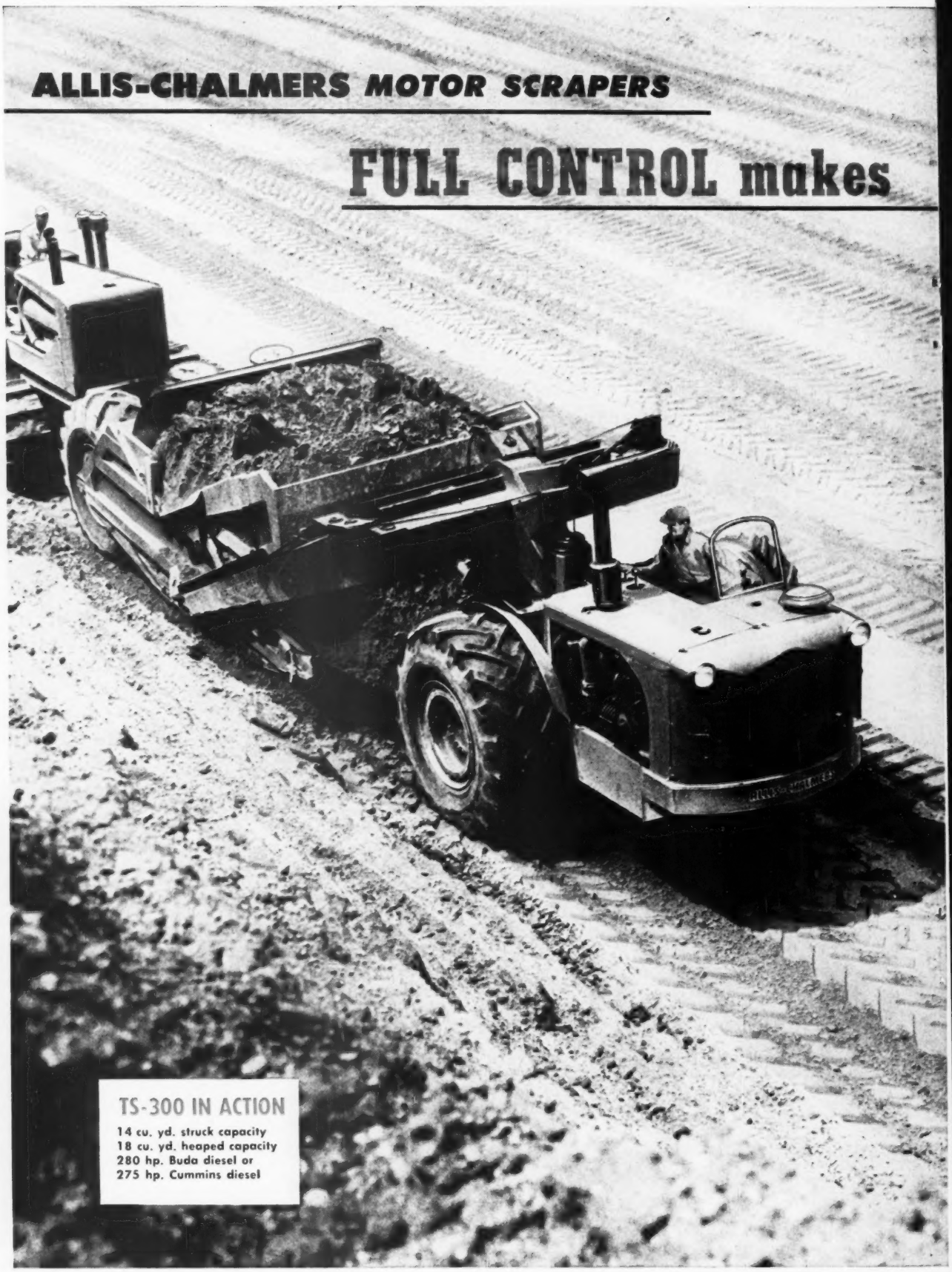


Lubricants and Fuels

FOR THE MINING INDUSTRY

ALLIS-CHALMERS *MOTOR SCRAPERS*

FULL CONTROL makes

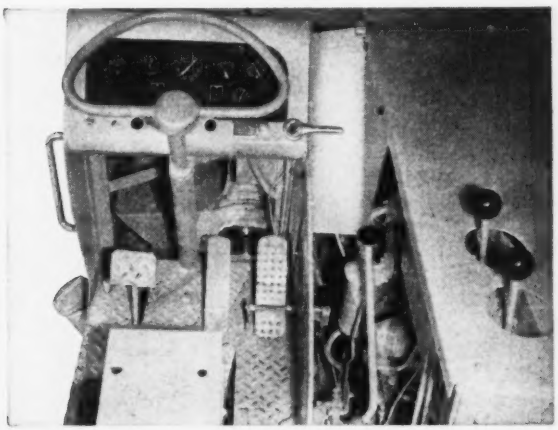


TS-300 IN ACTION

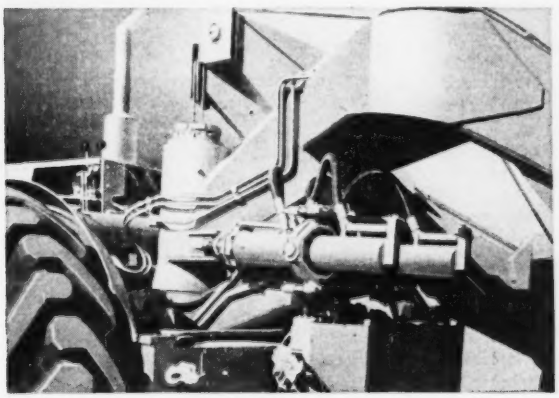
14 cu. yd. struck capacity
18 cu. yd. heaped capacity
280 hp. Buda diesel or
275 hp. Cummins diesel

the difference

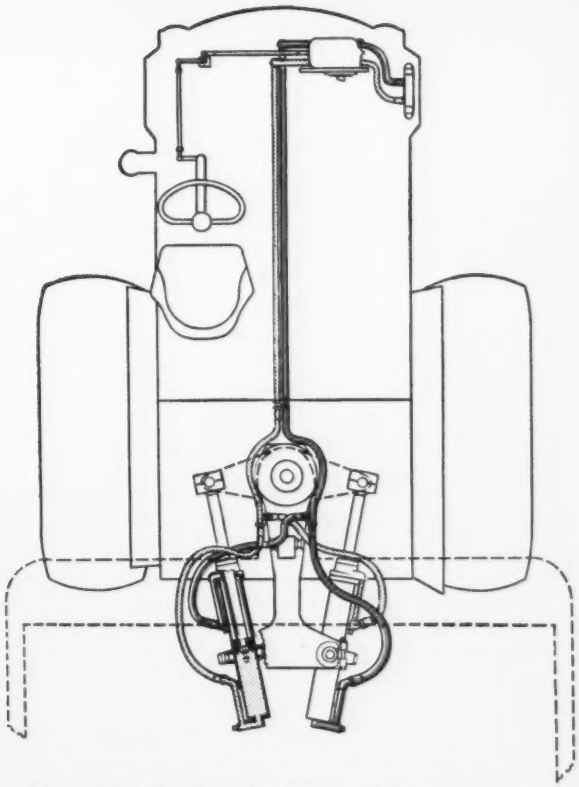
The full control built into Allis-Chalmers *Motor Scrapers* offers you a real advantage. There's no tiring wheel fight for the operator . . . no straining to see what he's doing. What's more, full control creates greater confidence when he's high-balling a full load. He can work at his best all day long easily and safely. That means moving *more* dirt *faster* and at a lower cost.



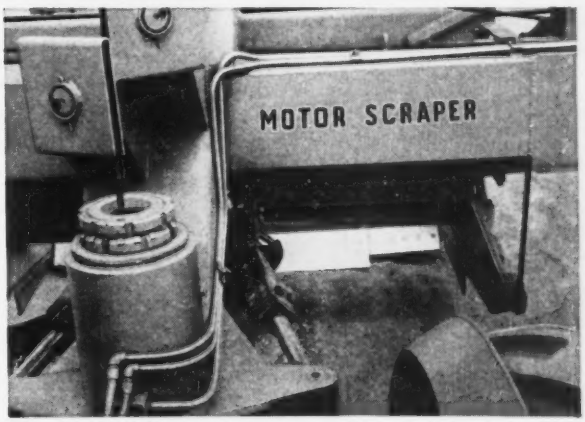
One Hand Does the Steering—the other handles the scraper controls. Fast action makes loading easy. The operator can utilize hydraulic power of steering jacks to pull through soft spots in haulways under extreme conditions.



No Weaving—No Road Shock — Hydraulic system is locked and the *Motor Scraper* becomes a rigid 4-wheel unit except when steering wheel is turned, thus eliminating transmission of road shock to steering wheel. Low-mounted rams, close to load line pull, mean minimum stress on the kingpin.



Easy, Fast-Action Steering — Schematic layout shows simple double-action steering system. Slightest movement of wheel opens valve of gear-type pump; release wheel and valve automatically returns to "hold." Only a one-third turn of steering wheel is necessary for a full swing of the tractor.



Excellent Operator Visibility — Clean design of low gooseneck connection gives operator unequalled view of cutting edge, helps him cut cleanly, efficiently . . . load fast and full.

Your nearby Allis-Chalmers dealer will be glad to show you and give you the full story on these job-proved *Motor Scrapers*. See them at work.

ALLIS-CHALMERS
TRACTOR DIVISION — MILWAUKEE 1, U. S. A.

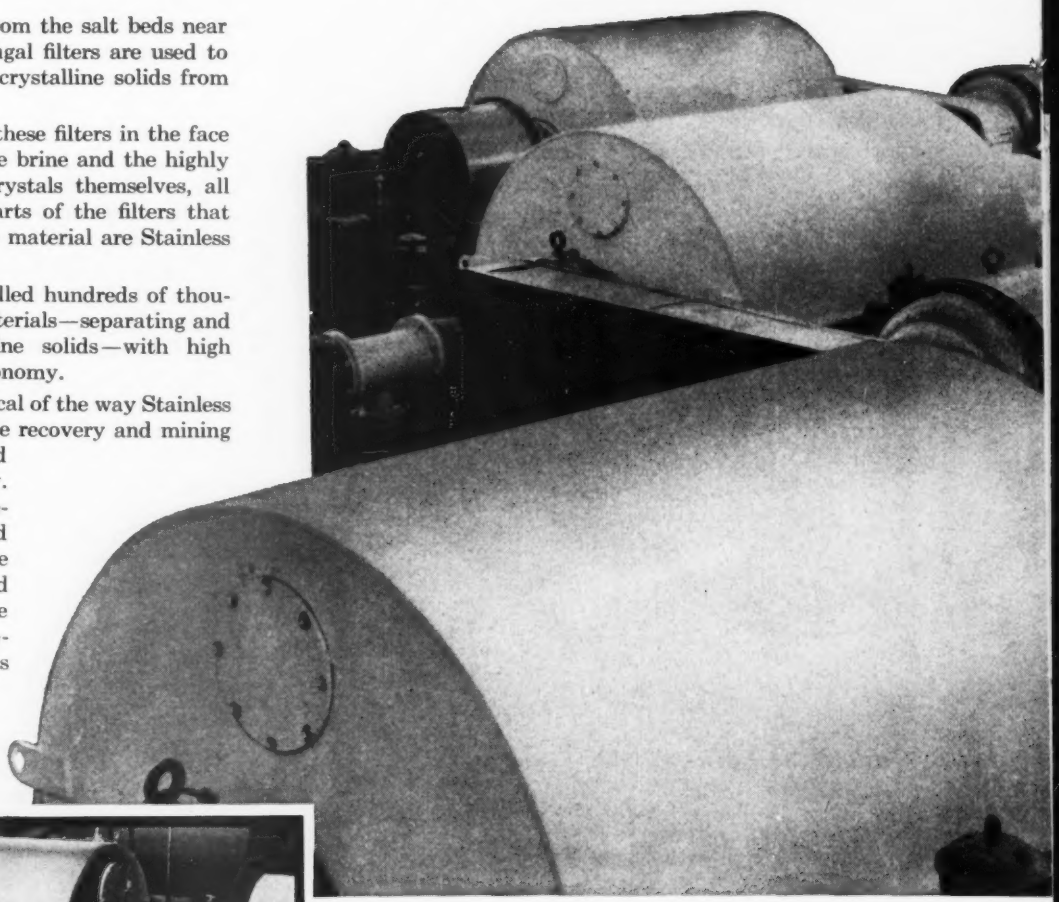
Stainless Steel centrifugals resist the attack of potash brine

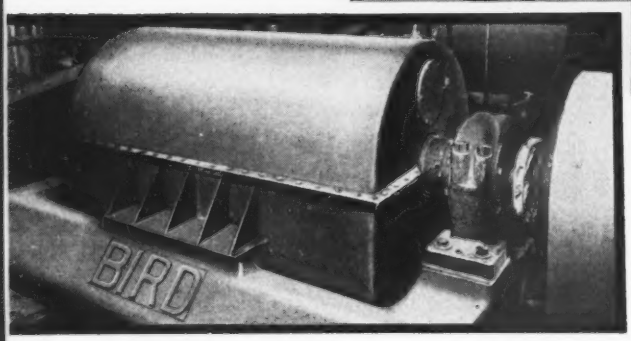
● In processing potash from the salt beds near Carlsbad, N. M., centrifugal filters are used to remove various types of crystalline solids from the potash brine.

To assure long life for these filters in the face of the corrosiveness of the brine and the highly abrasive action of the crystals themselves, all rotating parts and all parts of the filters that come in contact with the material are Stainless Steel.

These filters have handled hundreds of thousands of tons of these materials—separating and dewatering the crystalline solids—with high efficiency and over-all economy.

This application is typical of the way Stainless Steel can be used to make recovery and mining equipment last longer and operate more efficiently. Where you need high resistance to corrosion and abrasion, investigate the use of Stainless Steel. And for finest performance, be sure perfected, service-tested U·S·S Stainless Steel is used.





BIRD FILTERS at Duval Sulphur & Potash Company, Carlsbad, N. M., are fed from the flotation cells that separate potassium chloride from sodium chloride. The feed contains about 40% solids. The filters that handle the sodium chloride tailings with a fresh water wash to recover the residual brine are Stainless Steel. They handle a ton of tailings per minute.

ANOTHER BIRD CENTRIFUGAL FILTER in the Carlsbad area. This machine at International Minerals & Chemical Corporation handles 10 tons of 60% muriate crystals per hour. All the filters shown were manufactured by Bird Machine Company, South Walpole, Mass.

UNITED STATES STEEL CORPORATION, PITTSBURGH. • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S STAINLESS STEEL

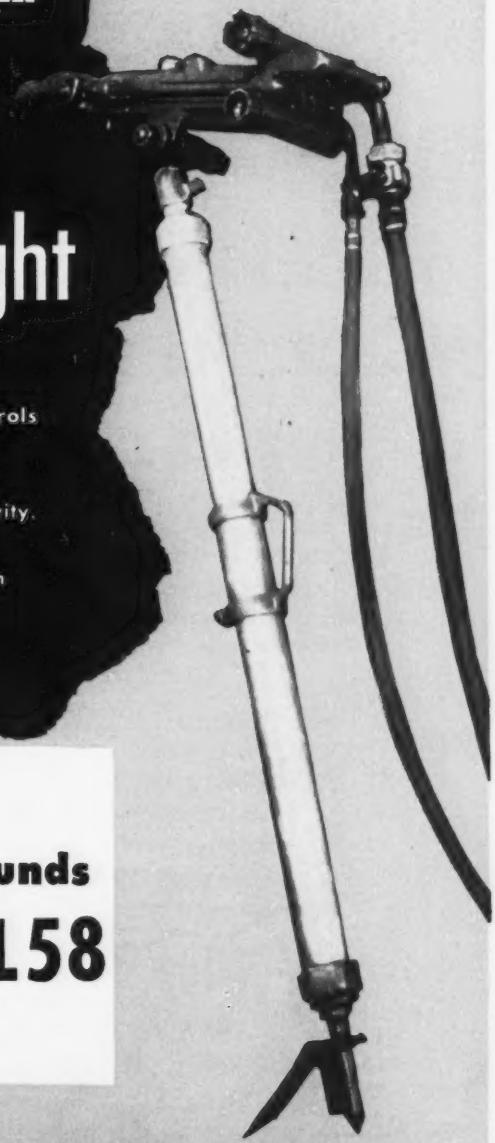
SHEETS • STRIP • PLATES • BARS • BILLETS USS PIPE • TUBES • WIRE • SPECIAL SECTIONS

4-285

UNITED STATES STEEL

GARDNER-DENVER
announces . . .

two new lightweight
One-Man Air-Leg Drills



new convenient controls
quickly respond.

new handling ease
increases productivity.

new versatility
for up holes, down holes, drifting, stoping, slashing.

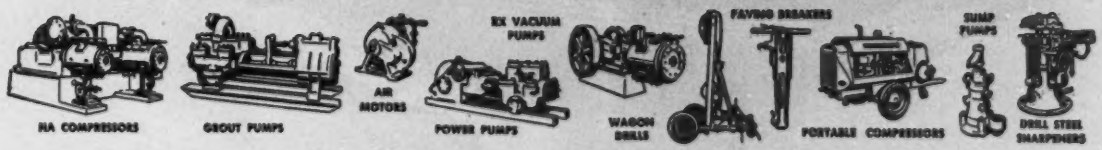
only 79 pounds
the 2½" model FL48

Built to stay underground.
Write for full details.

only 87 pounds
the 2⅝" model FL58

SINCE 1859

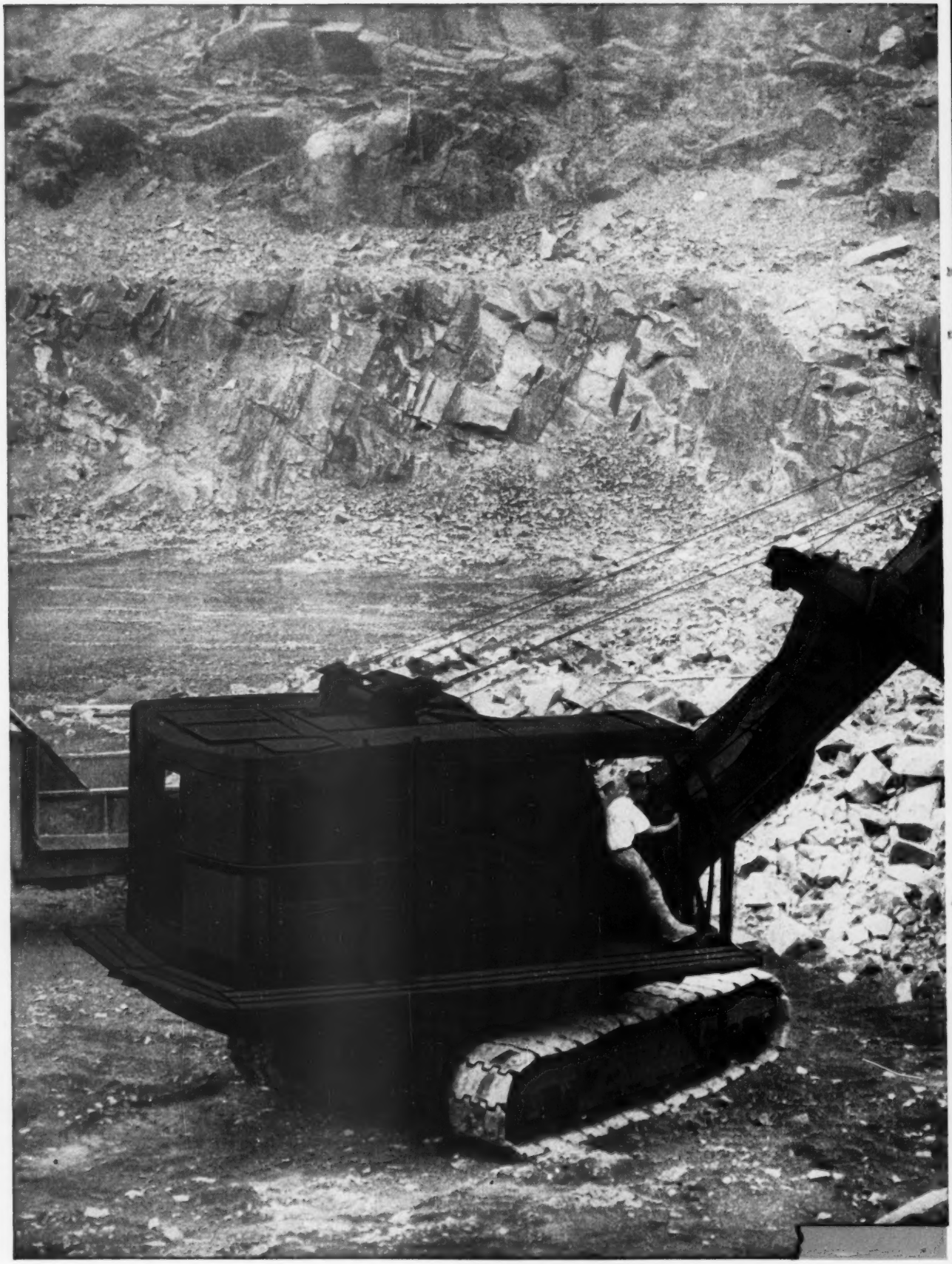
GARDNER-DENVER



THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS
FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd. 14 Curity Avenue, Toronto 13, Ontario



MEASURE OUTPUT

by "Koehring Work Capacity"

There are some very simple ways to measure output of excavators and cranes in advance. Take lifting capacities, for example. Obviously, the machine with the heaviest lift capacity will not only pick up larger crane loads, it also has more stability and power to increase shovel and hoe production — handles bigger dragline and clamshell buckets on a wider work range.

Be sure to check lift ratings, and other clear-cut measurements of "KOEHRING WORK CAPACITY", before you buy any excavator or crane. Your Koehring distributor has important figures to show you — ask for them.

KOEHRING Company

MILWAUKEE 16, WISCONSIN

Subsidiaries: PARSONS • KWIK-MIX • JOHNSON

K332

KOEHRING HEAVY DUTY

lift capacities up to 79½ TONS . . . ½ to 2½ YARDS dipper capacities

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT Calol Multi-Service Oils

UNITS Compressors 14×12 14×12 14×14
9×12 7½×12 10×14

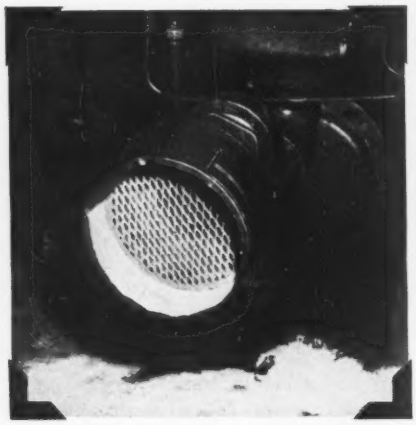
LUBRICATOR Force feed and crankcase

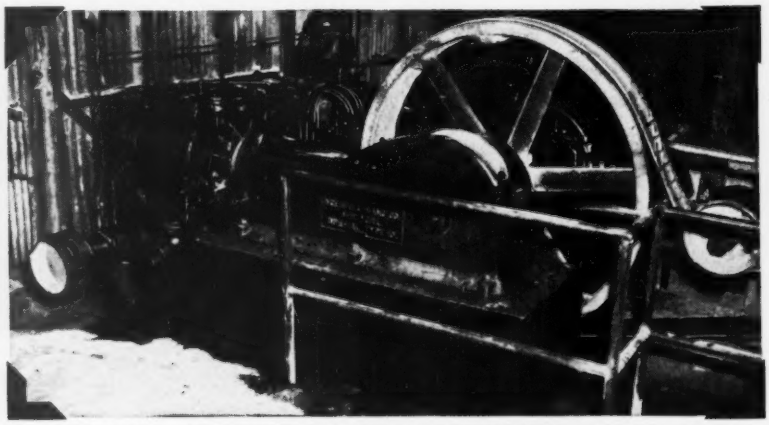
CONDITIONS Extreme dust conditions

PERIOD 7 years

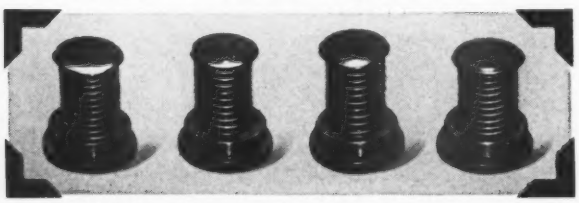
FIRM U. S. Lime Products Corp., Sonora, Calif.

Lime mine compressor rings still good after 7 years!





LUBRICATED WITH CALOL MULTI-SERVICE OIL 55X, this is one of three Ingersoll-Rand compressors that supply all air for the Sonora, Calif., mine of the U.S. Lime Products Corp. Heavy coating of lime dust on the air intake and floor indicates the extreme conditions under which the compressor works. Even so, when pistons were pulled for the first time after seven years, rings were found to have no deposits, ports and grooves were free and clean—and the entire assembly was returned to operation.



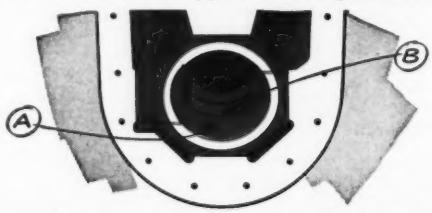
THESE VALVES, taken from the compressor's low side, get the first dust from the air intake. Note how they are free from all deposits.

FREE CATALOG: "How to Save Money on Equipment Operation," a new booklet full of valuable information, will be sent you on request to Standard Oil Company of California, 225 Bush St., San Francisco, Calif.

CALOL

TRADEMARK "CALOL" REG. U.S. PAT. OFF.

Now CALOL Multi-Service Oil cuts costs in all types of compressors



In crankcase and on cylinders, Calol Multi-Service Oil reduces wear and oil consumption —has cut consumption 20% in air compressors.

A. Oxidation-resistant compounds prevent formation of varnish. Detergent keeps contaminants suspended in oil, prevents foam.

B. Special compound assures "hot-spot" lubrication...covers surfaces rapidly.

Calol Multi-Service Oils also recommended for pumps, diesel engines, enclosed gears.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY
P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas

THIS TRUCK CRANE IS DIFFERENT!

If you check this you'll believe it! Here's a machine that will do the lifting jobs around the mill. It gets around easily. Power steering is available for the assurance of good control where the going is rough. There is a wide range of tires and there are screw jacks for the out-riggers if required. The Northwest Truck Crane is a real answer to your handling problems, unloading and loading problems and machinery setting problems. Check its advantages!

THE CRANE

- The "Feather-Touch" Clutch Control makes operation easy without resorting to pumps, compressors and valves that often require special knowledge for adjustment. You won't be shut down because of control failure.
- Uniform Pressure Swing Clutches take the jerks and grabs out of swinging, make the spotting of loads smoother and safer and speed up handling.
- Cast Steel Machinery Side Frames and Bases withstand the shock of rough work, maintain shaft and bearing alignment and reduce wear.
- All high-speed Shafts mounted on ball or roller bearings.
- Cushion Clutch reduces shock overloads *before* they can damage machinery.
- Convertible to Shovel, Dragline or Pullshovel.

THE CARRIER

- There is no other Crane Carrier with the construction features of the Northwest.
- Unified box-section frame design proved in Northwest shovel booms.
- Bed plate extends full length for even distribution of stresses.
- Base casting vertical flange members extend downward over sills to distribute loads.
- Outrigger frames extend full width.
- Rear outrigger housing is easily removed for better clearances when operating as Shovel or Pullshovel. Base casting does not have to be repositioned.
- Improved design of axle construction walking beams and support brackets.

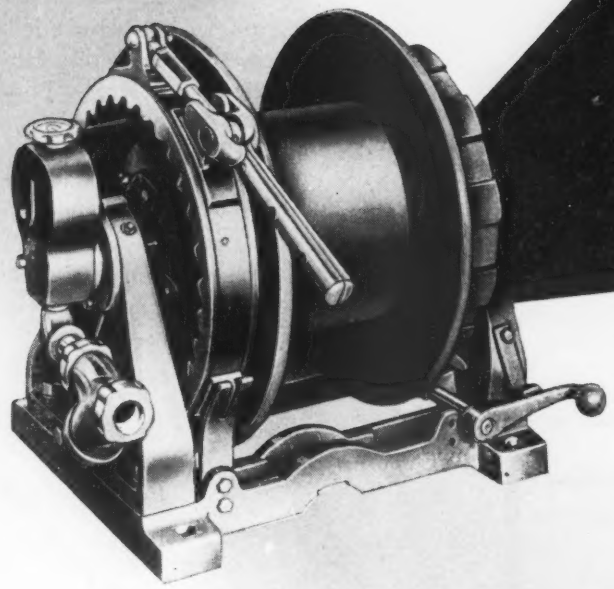
NORTHWEST ENGINEERING COMPANY
1509 Field Building, 135 South LaSalle Street,
Chicago 3, Illinois

This is only part of the story. You'll be interested in the very complete catalog on this machine. If you are considering truck mounted equipment, we will be glad to send it.

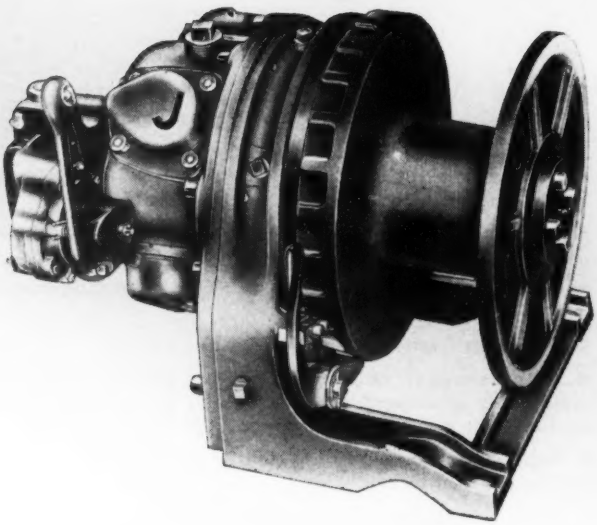
DON'T BUY A TRUCK CRANE UNTIL YOU HAVE SEEN A NORTHWEST

NORTHWEST

Convertible for any Mining Material Handling or Excavation Problem



JOY



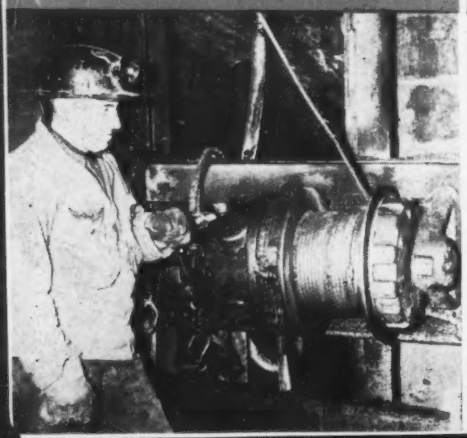
TOP: Model F-113 "Turbinair". Compact, simple design with motor *inside* the drum. Direct power transmission from motor to drum assures maximum efficiency. Simple, accessible controls make operation easy.

RIGHT: Model DW-111 "Pistonair". Features reversible power with light weight. Four-cylinder, 3½ h.p., reversible motor will handle up to 1200 lbs.

FAR RIGHT: Model L-111 "Pistonair". For heavy hoisting jobs. 7½ h.p., reversible, five-cylinder motor for loads up to 2000 lbs.

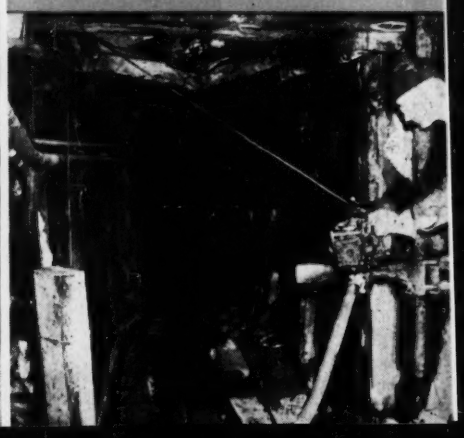
OVER 100 YEARS OF ENGINEERING LEADERSHIP

Joy L-111 reversible "Pistonair" Single Drum Hoist operating in a magnetite iron mine in the Adirondack region of New York.



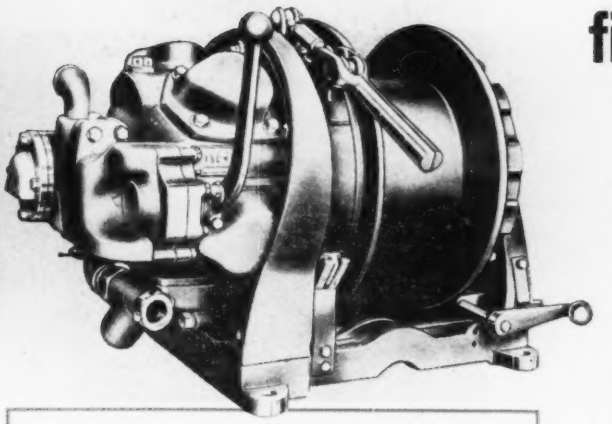
Joy E-112 "Turbinair" lifting timbers in a raise in a western mine. The extra rope capacity of the E-112 (450' of ⅝" rope) makes it applicable to *any* of the utility hoisting needs in this mine.

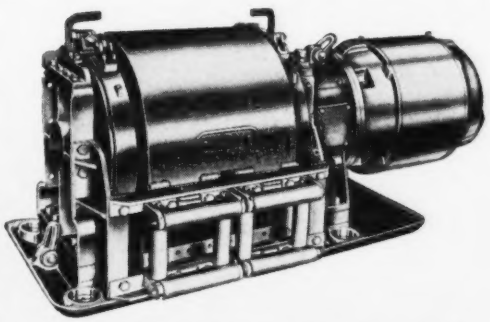
Joy AW-80 Air Winch hoisting timbers into place in a drift in a Canadian mine. At a weight of only 85 lbs., this unit will lift 500 lbs!



SINGLE DRUM HOISTS

They're real Mining Hoists—designed and built from long field experience expressly for underground use





The new Joy B2F-211 double drum Slusher, compact and rugged . . . now has 15% greater rope capacity. Joy two- and three-drum Slusher Hoists are available in a wide, all-purpose range from 5 to 150 HP.

Joy Single Drum Mining Hoists are compactly designed, of modern, high-strength alloy metals, for lighter weight with greater power and efficiency.

The complete Joy line includes the "Turbinair" series which develop maximum horsepower per unit of weight; the "Pistonair" with reversible four or five cylinder motors; and compact, rugged electric-powered models which feature space-saving short-length external motors.

Joy Single Drum Hoists are built with lifting capacities ranging from 500 to 3500 lbs., and rope capacities from 150 to 1500 ft. "Pistonair" models have a positive acting safety brake which holds the load in any position when the throttle valve is "off."

Joy also manufactures a complete line of Shaft Hoists, and Two- and Three-Drum Slusher Hoists in capacities to handle all hoisting and scraping needs.

● ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.,*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Write for Bulletins, or . . .

Consult a Joy Engineer

JOY

W&D M505

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

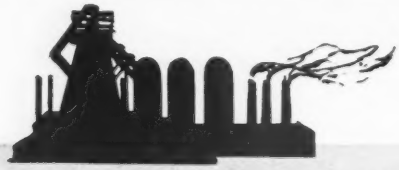
THE COLORADO FUEL

CF&I

Four
of the
Twelve
CF&I Plants

CF&I MILL, PUEBLO, COLORADO—From its own iron ore, limestone and coal mines steel is made into Grinding Balls, Mine Rails and Accessories, Grinding Rods and many other steel products.

CF&I MILL, OAKLAND, CALIF.—In this plant steel rods made in the Pueblo Mill are drawn into wire for the fabrication of Cal-Wic Industrial Screens—many of them made specifically for the mining industry.



IRON OR STEEL PRODUCTS PLANTS

Birdsboro, Pennsylvania
Buffalo, New York
Claymont, Delaware
Pueblo, Colorado
Roebling, New Jersey

STEEL FABRICATING PLANTS

Buffalo, New York
Claymont, Delaware
Clinton, Massachusetts
Mt. Wolf, Pennsylvania
Oakland, California
Palmer, Massachusetts
Pueblo, Colorado
So. San Francisco, California
Trenton, New Jersey
Worcester, Massachusetts

AND IRON CORPORATION

STEEL PRODUCTS FOR THE MINING INDUSTRY

CF&I is a name to remember and a company to count on for steel and steel products for the mining industry.

Among the top steel producers of America, none surpasses CF&I in the diversity of the products that flow from its mills to the mines, homes, farms, railroads and other industries.

The subsidiaries and divisions of CF&I make up a fast-growing and nation-wide family. Their plants and mills furnish products that have won for CF&I an outstanding reputation for quality and reliability.

CF&I MILL, BUFFALO, NEW YORK—This fully integrated iron and steel mill supplies steel rods for its own use and for CF&I fabricating plants throughout the East.

CF&I MILL, PALMER, MASS.—This plant fabricates wire drawn from steel rods supplied by the CF&I Buffalo Plant into Wickwire Rope.

THE COLORADO FUEL AND IRON CORPORATION, Denver, Colorado

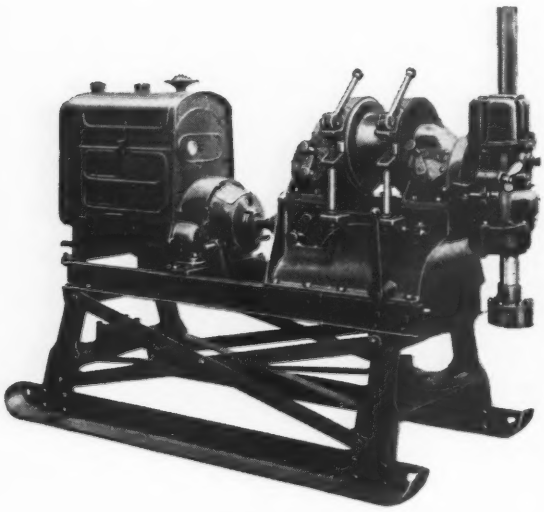
WICKWIRE SPENCER STEEL DIVISION, New York, N. Y. • PACIFIC COAST DIVISION, Oakland, Calif.

THE COLORADO FUEL AND IRON CORPORATION

CFI

1930

LOOKING FOR New Deposits?



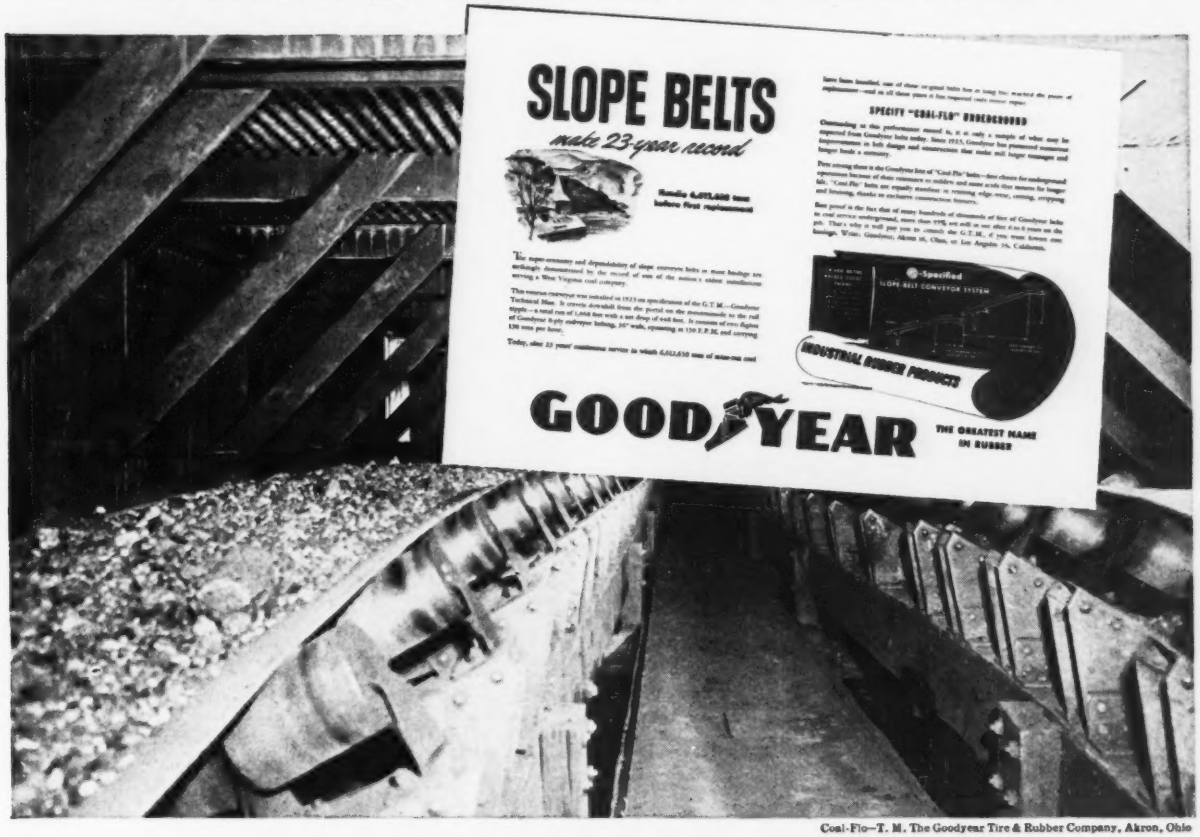
Whether you're mineral prospecting or looking for extensions of existing deposits, you'll wind up with the right information easier and faster by using the skid mounted CP-8 and CP-15 Diamond Core Drills. Specifically engineered to withstand the continued high drilling speeds made possible by bortz bits, they're available with gas, diesel or electric drive for surface drilling and air drive for sampling underground. And they can be readily moved from hole to hole under their own power. Bolted frame permits easy disassembly for transportation to remote sites. With E-EX fittings the CP-8 has capacities to 1250 ft., the CP-15 to 2250 ft. For more complete information, write: *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.*

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

GOODYEAR QUALITY PAYS OFF AGAIN:

A RECORD BREAKER IN 1946 —



Coal-Flo—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

and still going strong

IN 1946, this conveyor smashed all records for length of service. It hauled over 6,000,000 tons of soft coal in *23* years of continuous operation. Today, over 75% of the original belt is still on the job with more than 10,000,000 tons in over *30* years behind it and many more tons and years to go.

Records like this are a major reason why Coal-Flo, as specified by the G.T.M.—Goodyear Technical Man—is your best belt buy. Your G.T.M. can give you all the facts and figures you need to justify your specifying and buying Coal-Flo. You can contact him through your Goodyear Distributor or by writing Goodyear, Industrial Products Division, Akron 16, Ohio. • • •

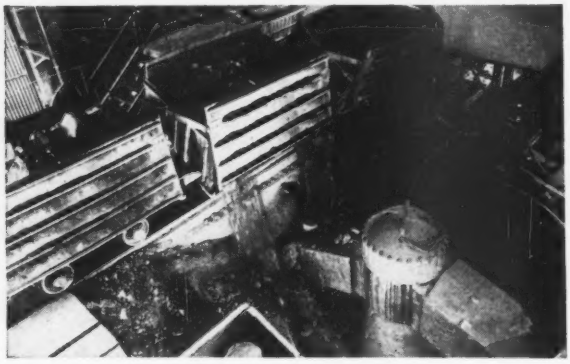
YOUR GOODYEAR DISTRIBUTOR *can quickly supply you with Hose, Flat Belts, V-Belts, Packing or Rolls. Look for him in the yellow pages of your Telephone Directory under "Rubber Products" or "Rubber Goods."*

GOODYEAR

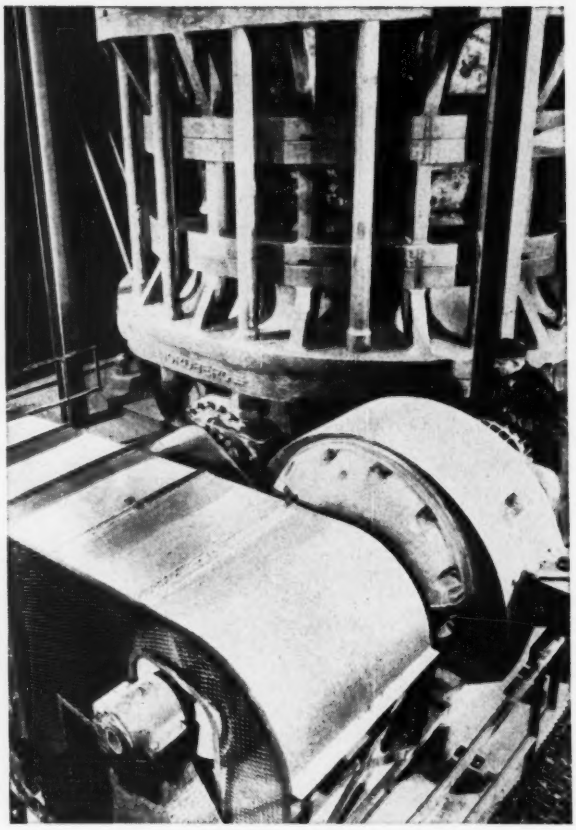
THE GREATEST NAME IN RUBBER

We think you'll like "THE GREATEST STORY EVER TOLD"—every Sunday—ABC Radio Network—THE GOODYEAR TELEVISION PLAYHOUSE—every other Sunday—NBC TV Network

1 SEVEN SPECIALLY-DESIGNED 20-ton G-E mine locomotives provide maximum efficiency and safety. Center cab assures maximum visibility, is weather-proofed and heated.



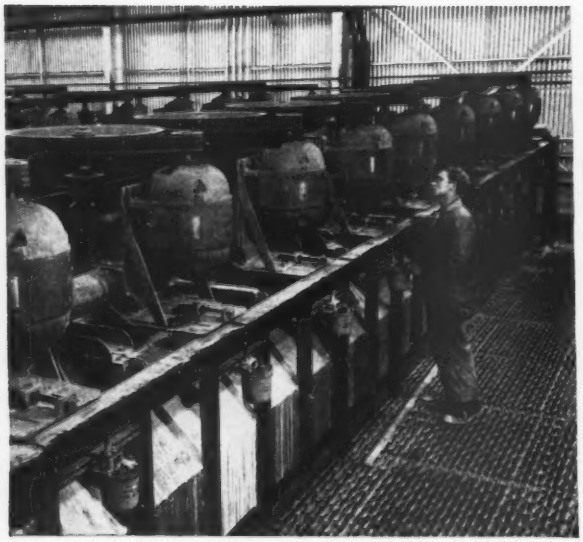
2 GREATER ORE HAULAGE is provided by fast, new G-E locomotives. Each pulls 20, 10-ton cars per trip—and increases the trips per day.



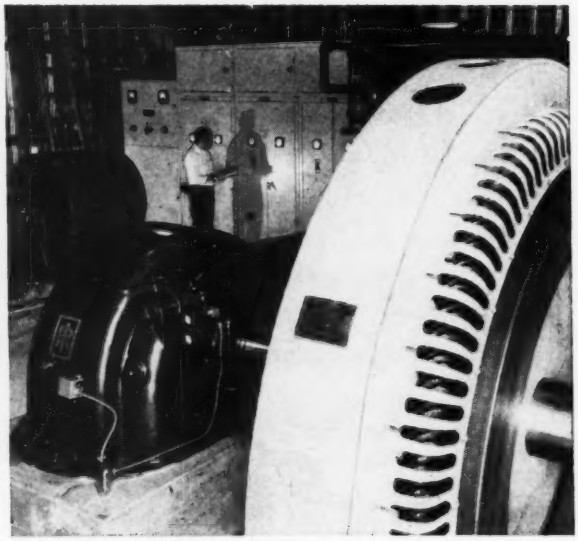
3 WORLD'S LARGEST GYRATORY CRUSHER, driven by dependable G-E 500-hp Tri-Clad* wound rotor motor, is a key feature of the Climax expansion program.

*Reg. trade-mark of the General Electric Company

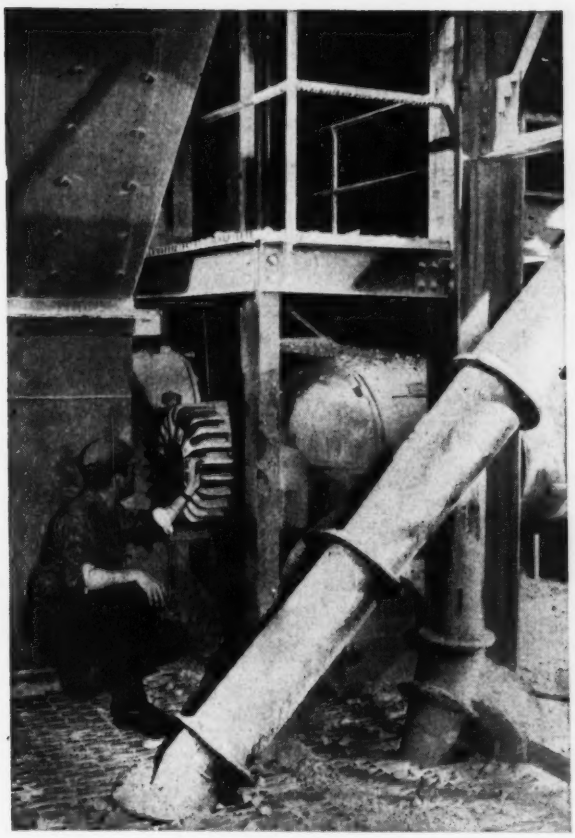
Climax Molybdenum expands,



7 HIGH EFFICIENCY is provided in flotation cells by G-E 7½-hp squirrel-cage motors—an important factor in round-the-clock operation. Convenient, individual oil-tight controls enable motors to be reversed when necessary.

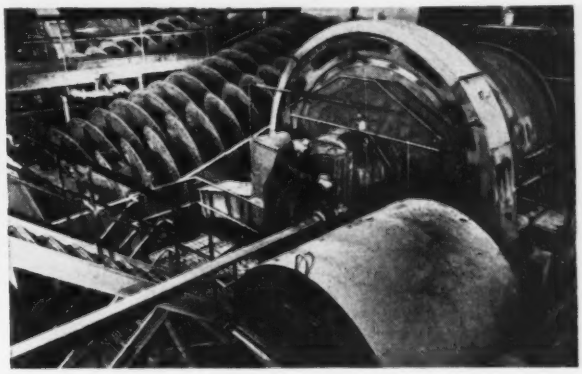


8 AIR COMPRESSORS at Storke Level are driven by G-E synchronous motors, one 500-hp and one 600-hp in foreground. D-c power for Storke Level locomotives is provided by 300-kilowatt G-E mg set through G-E control (background).



4 SPECIAL CONE-CRUSHER DRIVE assures a minimum of interruptions and less maintenance. Enclosed collectors on G-E Tri-Clad wound rotor motor helps protect against dust.

5 PRODUCTION CONTINUITY is provided by enclosed, heated conveyors driven by 350-hp and 250-hp motors. These carry ore from Storke Level crusher to final-stage crushing.



6 HEAVY-DUTY G-E MOTOR—500-hp, 300-rpm—under enclosure (foreground) drives this large ball mill which is in closed circuit with classifier.

hits record 23,000 tons a day

Co-ordinated G-E electrical system plays key part in setting record output of mine and mill

A multimillion-dollar expansion program now in process has enabled the Climax Molybdenum Company, Climax, Colo., to reach a record output of 23,000 tons of raw molybdenum ore per day. It will become one of the world's largest underground mines with a daily output of 28,000 tons when the program is completed. Instrumental in making this output record possible were General Electric application engineers who worked closely with Climax engineers to co-ordinate the project's electrical system.

In this remote mountain location, with operating points great distances apart, the G-E electrical system has helped integrate the mining and milling processes into a smooth-flowing production line. By providing reliable, 24-hour-a-day operation, co-ordinated G-E electrical systems helped to step up daily production as much as 5000 tons within the last two years—another example of the value of system planning.

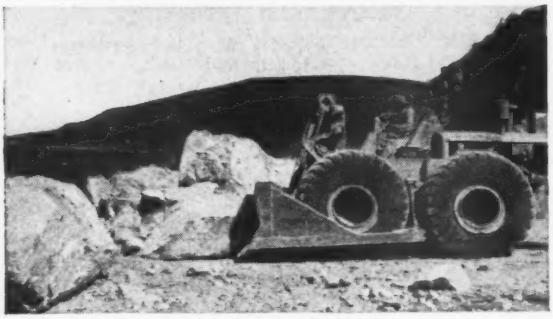
The same G-E engineering leadership which helped Climax reach its record output is available to you for your expansion or modernization planning. Contact your Apparatus Sales Representative at your nearest G-E Apparatus Sales Office—early in the planning stage. General Electric Co., Schenectady 5, N. Y.

660-30

Engineered Electrical Systems for the Mining Industry

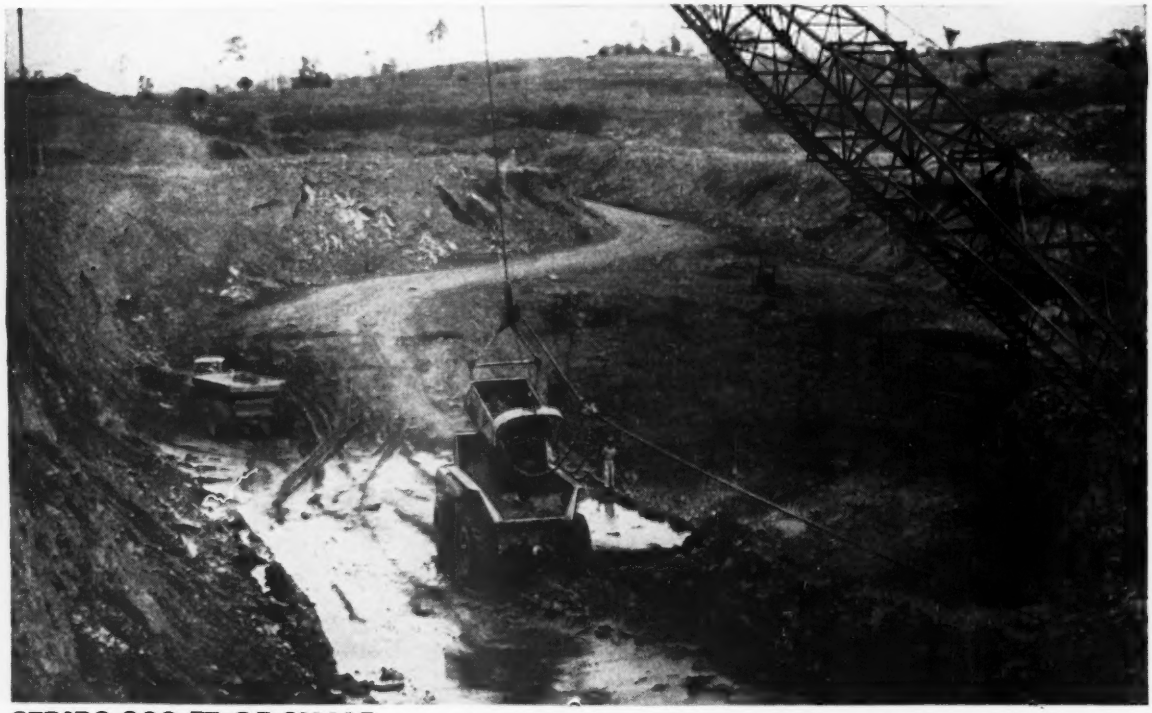
GENERAL ELECTRIC

Pictures of the month . . . by LeTourneau-Westinghouse



HAUL 30 TONS OF ROCK — 90 miles south of San Diego, Calif, at Ensenada, Mexico, 6 rear-dump Tournarockers and 1 Tournatractor are extending this 180-ft-wide breakwater 5000 ft into more than 50 ft of water. Hauling over existing fill, Tournarockers make one-mile cycles with 12 pay yds every 7.7 minutes. Some rocks hauled measure 5 x 6 x 12 ft and weigh over 30 tons. Tournatractor (below) levels fill and maintains haul road. Say Equipment Owners Clark & Mansilla, "It's amazing how well these machines stand up under the rough conditions we are working in."

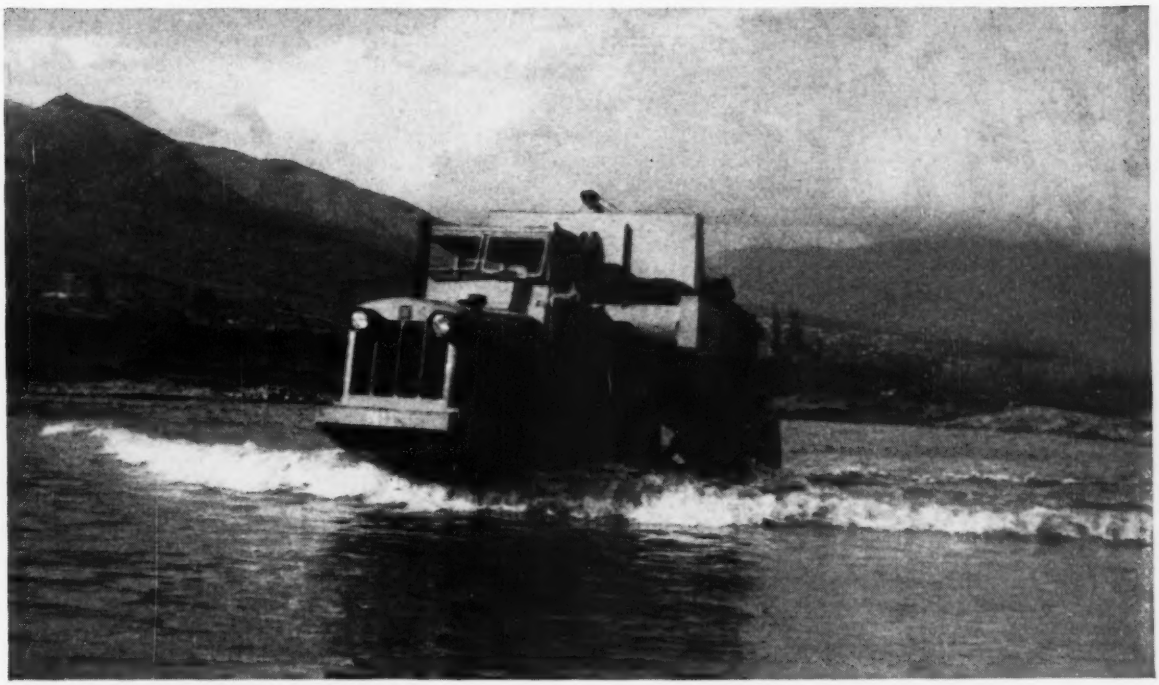
MOVES SAND THAT OTHERS CAN'T —Finley P. Smith, alternately stripping his Florida stone quarry and leveling beach property, uses 5 D Tournapulls and 3 Tournatractors for all work. He gives as typical output for each Tournatractor-loaded 7-yd "D" . . . 10 pay yds of sand hourly on 600 to 1000 ft hauls, 120 pay yds on 400 ft hauls. Says Smith, "No other scraper can move this beach sand. They're all too heavy to get traction in the poor footing." When stripping rock mixed with sand from the quarry, each "D" moves 80 to 90 yds hourly over 300-ft hauls.



STRIPS 200 FT OF SHALE to reach 30 ft seam of coal. This open-pit provides the country of Malaya with its only source of coal. The miners are working 18 LeTourneau haulers 21 hours a day, 7 days a week. Each hauls 18 tons of overburden per load. They averaged 15 mph over narrow, hilly, winding haul roads. Units on one-mile cycles deliver 9 to 10 loads per 50-minute hour.

(Advertisement)

. . . with performance reports from around the country



DRIVES THROUGH WATER — Tournarocker's ability to travel through water without damage is an important advantage on many mine and quarry installations. This picture illustrates how Tournarocker hauls gravel and sand from river-bed to the new public stadium in Medellin, Colombia. River bottom is rough and full of rocks and holes. Water depths range from 20 to 30 inches, but Tournarocker disc-type air brakes and electric control system have not been harmed, or even affected, in a year of this work. Dragline loading and haul underwater were necessary because the river bed was only nearby source of material for concrete.

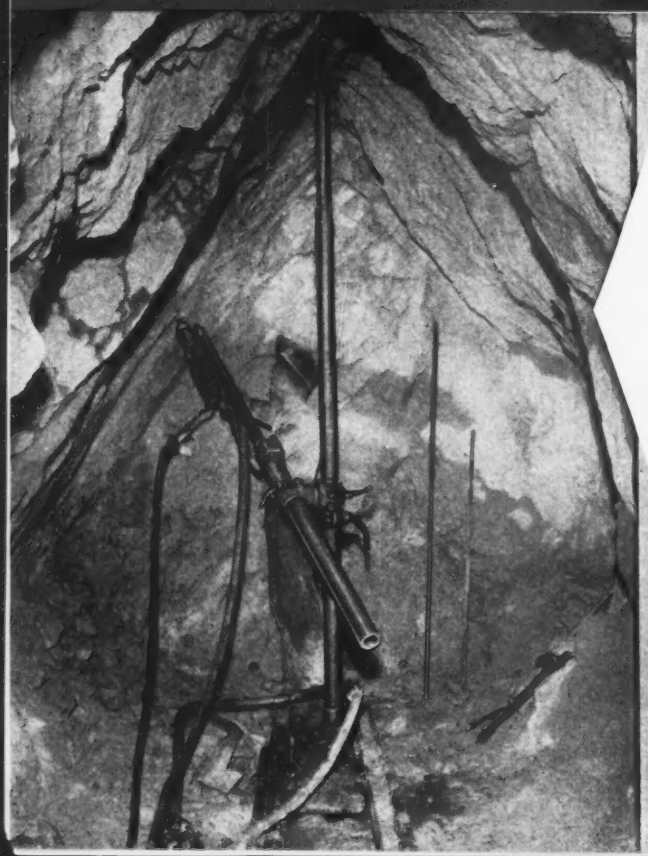
DOUBLE-DUTY — Vernie Jarl, Gresham, Oregon, by interchanging 18-ton Scraper and Rear-Dump trailing units, works his 4 C Tournapull prime-movers efficiently on both rock and dirt jobs. About Scrapers, Owner Jarl says, "They move dirt cheaper than tractors on any length haul." About Rear-Dumps, his Superintendent, Art Bolder, says, "They're the only rigs that work efficiently in the tight quarters we have here."

220 TONS HOURLY — A large Southern utility reclaims 220 tons (298 yds) of stockpiled coal per 50-min hr with their Tournatractor-Carryall team. Rig works 1000 ft "figure-8" cycle from edges of pile to centrally-located conveyor . . . makes 29 trips hourly. Operator says, "Tournatractor handles coal faster than anything I've seen in 9 years." For details on tools shown here, write LeTourneau-Westinghouse Company, Peoria, Ill.

Tournapull, Carryall, Tournarocker—Trademark Reg. U.S. Pat. Off. Tournatractor—Trademark Pic-610-M

(Advertisement)

New! Speeds up



Miners like Le Roi-CLEVELAND HC23RW Reverse Air Feed Drifters

Management does, too

Faster Steel Changes! No swing or dump nuts to loosen and reset. Your miners simply swing drifter on feed cylinder and change steels. It's not only easy — it lets them drill out the round faster.

No Stuck Steels! Positive air feed keeps drills working at peak efficiency, avoids stuck steels.

Higher Drilling Speeds! Positive air feed plus proper force of blow and strong rotation give faster drilling speeds with both steel and tungsten carbide bits. You get longer bit life, too, and drill more footage.

Low Upkeep Cost! No feed screws or feed-screw nuts to wear. No complicated power-feed mechanism to give trouble.

Easy to Operate! Built to lighten the load on your miners. Feed controls conveniently located. Reverse air feed withdraws steel from hole quickly.

Faster Set-ups! The combination of Le Roi-CLEVELAND Air Feed Drifters and air columns gives you a unit that can be set up easily and quickly. And you can get the air column in any height you want.

drilling cycles

Le Roi-CLEVELAND *self-leveling* Mine Jumbo with four-foot steel-change Air Feed Drifter

Saves time drilling lifters! Lets your miners drill the right round for any ground!

You couldn't ask for more from a mine jumbo than the performance you get from this new Le Roi-CLEVELAND. It's got plenty of stuff. And the payoff for you is faster cycles, greater tonnage per man-shift, lower costs! Here's why:

Self-leveling, air-motor-powered arm, lets miners spot and space holes quickly and easily, for the most efficient fragmentation. They don't have to loosen a bolt or tilt a boom, to complete the drilling cycle.

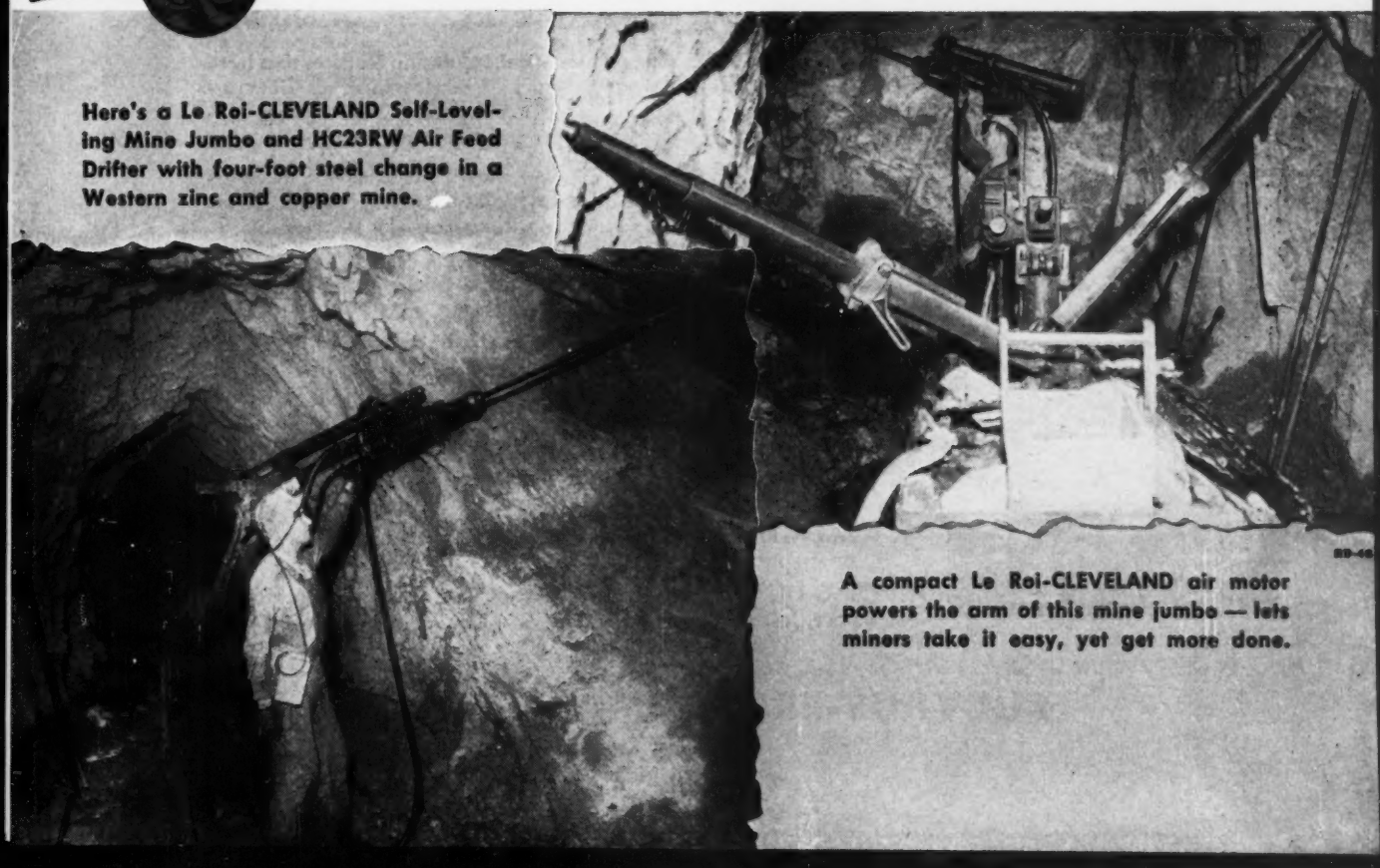
Exclusive rigid screw and gearing mechanism keeps the heading straight, cuts down overbreak and underbreak. Keeps the drifters in line, prevents the steel from binding, reduces chuck wear.

Offset arm provides plenty of clearance to drill lifters — without having to take time out to swing the drill under the arm.

You can get this Le Roi-CLEVELAND Self-Leveling Mine Jumbo in either single-arm or double-arm construction. Write for further information and see for yourself how either model can help you get more done every shift.

LE ROI COMPANY

CLEVELAND ROCK DRILL DIVISION
A Subsidiary of Westinghouse Air Brake Co.
12500 Berea Road, Cleveland 11, Ohio
Plants: Milwaukee, Cleveland and Greenwich, O.



Here's a Le Roi-CLEVELAND Self-Leveling Mine Jumbo and HC23RW Air Feed Drifter with four-foot steel change in a Western zinc and copper mine.

A compact Le Roi-CLEVELAND air motor powers the arm of this mine jumbo — lets miners take it easy, yet get more done.

59-46

announcing . . .

THE NEW BUCYRUS-ERIE

480-W

12 cu. yd. WALKING DRAGLINE

WARD LEONARD ELECTRIC or DIESEL

The new 480-W incorporates advanced design features that have been field-proved through years of service in other Bucyrus-Erie walking draglines. It is a big-yardage, all-weather machine, built for year-after-year profitable operation.

LONG WORKING RANGE — Moves material 431 ft. with 215-ft. boom and 8-yd. bucket without throwing bucket; 395 ft. with 195-ft. boom and 10-yd. bucket; and 359 ft. with 175-ft. boom and 12-yd. bucket. Digging depths range up to 141 ft.

EASILY MANEUVERED into best working position with exclusive Bucyrus-Erie walking mechanism.

ALL-WEATHER WORKER — Bearing area is large to permit working on soft ground. Weight and loads are balanced so center of gravity shifts through limited range, keeping base rim pressures low.

MAIN MACHINERY IS SIMPLE, and is firmly held in alignment on strong frame. Minimum of moving parts means low maintenance.

ALL-WELDED, TUBULAR-BRACED BOOM provides plenty of strength without excess weight.

BIG OUTPUT results from dependable, year-round performance, fast moves, and rapid work cycle.

You are invited to send for additional information on how the 480-W can help you solve stripping or other long range excavating problems.

BUCYRUS ERIE

46L53C

BUCYRUS-ERIE COMPANY SOUTH MILWAUKEE, WISCONSIN

DOUBLE-DUTY S-A conveyor carries either lead-zinc or tungsten ore to transfer point (left center) where tungsten ore is shunted to tungsten mill at left and lead-zinc ore is dumped in underground storage pocket for delivery to mill in valley. Belt is loaded at right foreground by another S-A conveyor emerging from underground.

ALUMINUM "SNAKE" almost ½ mile long, houses S-A conveyor carrying lead-zinc ore to processing in valley beyond ridge.

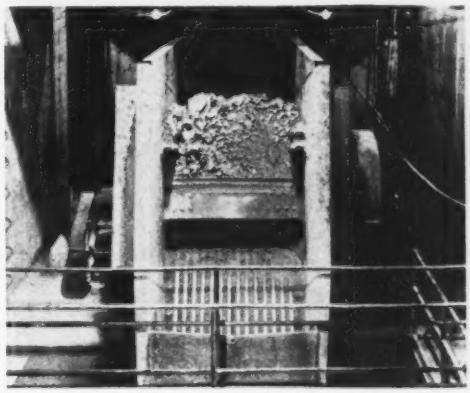
At Emerald Mine, B. C.

Conveying System Does Double Duty—Handles Both Tungsten and Lead-Zinc Ore...

A "sandwich" mine with layers of tungsten and lead-zinc ore created some real handling problems for the Canadian Exploration Company, Ltd. at their Salmo, B. C. installation. With both ores being mined simultaneously, handling by an existing aerial tramway and trucks proved far too expensive. S-A was called in to design and manufacture a system that would eliminate multiple handling while moving both types of ore efficiently.

The system installed and in operation since June, 1952, is an excellent sample of S-A's complete answer to a bulk handling problem. Two flights of the system (one underground) carry either tungsten or lead-zinc ore to a transfer point outside the mine. Here tungsten ore is shunted to a nearby processing mill while lead-zinc ore is dumped into an underground storage pocket. From here it is carried by conveyor flights down the mountain through a series of storage pockets to a mill in the valley. Feeders and screens as well as belt conveyors were built by S-A to fit exactly the requirements of the system.

When you look for ways to cut *your* ore handling costs, it will pay to call in S-A. Hundreds of plants have—with the result that they are now handling bulk materials at lowest cost per ton. Write for a free survey of your handling problem. Use coupon.



ALTERNATE FEED SYSTEM allows one conveying system to do the work of two! AMSCO Pan Feeder receives lead-zinc ore from chute at right, tungsten ore from chute at left.

SINCE 1901 S-A STEPHENS ADAMSON MFG. CO.

STEPHENS-ADAMSON MFG. CO.
4 Ridgeway Avenue, Aurora, Illinois
Los Angeles, Calif., Belleville, Ontario

Engineering Division	Specialists in the design and manufacture of all types of bulk materials conveying systems.
Standard Products Division	A complete line of conveyor accessories including centrifugal loaders—car pullers—bin level controls—etc.
SealMaster Division	A complete line of industrial ball bearing units available in both standard and special housings.

STEPHENS-ADAMSON MFG. CO.
4 Ridgeway Avenue, Aurora, Illinois

Please have an S-A engineer make a free survey of my bulk material handling problem.

NAME_____

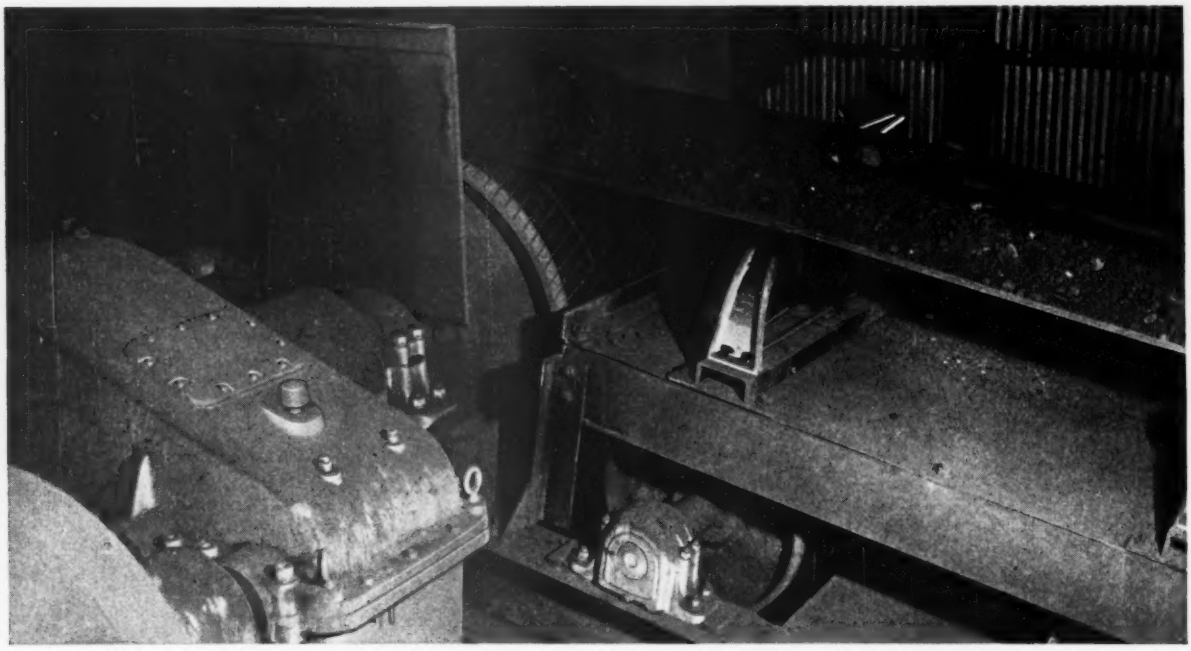
COMPANY_____

STREET_____

CITY_____ ZONE____ STATE_____

BEAT HIGH TRANSPORTATION COSTS--

carry the load via belt conveyors

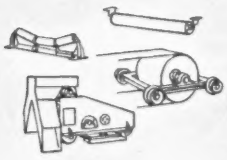


Engineered for long-life in ore handling, this Link-Belt 48-inch wide, inclined belt conveyor consists of Series 200 troughing idlers, welded steel pulleys (both plain and rubber lagged), roller bearings and an enclosed gear drive.

LINK-BELT offers you the "total engineering" so necessary for top efficiency

DESIGNED FOR OVERALL EFFICIENCY

Because of its unrivalled experience, Link-Belt can do a better job of gathering and analyzing all data. Proposals reflect this understanding of the most practical way to fit conveyors into your system requirements.



BUILT FOR LONG-LIFE PERFORMANCE

Link-Belt manufactures all components and related feeders and conveyors. You are assured of the right equipment because of this breadth of line. And Link-Belt will supply the highest grade belts engineered to the job.

DELIVERS FULL RATED CAPACITY

Link-Belt follows through on every detail of the job, including electrical controls and even wiring and foundations. What's more, Link-Belt will furnish experienced erection superintendents, staffs and skilled crews.

ASSURES SATISFACTORY PERFORMANCE

When you rely on Link-Belt as a single source for your complete system, Link-Belt accepts responsibility for placing it in full operating readiness. We will also supervise modernization of existing systems.

Next time you're in the market for one belt conveyor or a complete system, call a conveying expert in the Link-Belt office near you. It's his job to help you get the best in belt conveying at the lowest possible overall cost.

LINK-BELT

BELT CONVEYOR EQUIPMENT

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

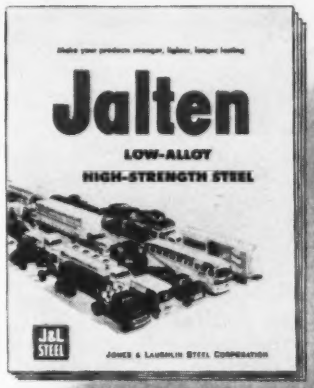
13.390

J&L's New JALTEN series enables you to select low-alloy, high-strength steel in the following combinations of advantages:

JALTEN No. 1 — High strength, good formability and fabricating —good resistance to low temperature impact.

JALTEN No. 2 — High strength, moderate forming— improved resistance to atmospheric corrosion.

JALTEN No. 3 — High strength—improved resistance to abrasion.



The data you want is in this book:

- Chemical Properties of Jalten
- Mechanical Properties of Jalten
- Jalten Equivalents
- Jalten Application Data

Remember to specify JALTEN High Tensile Steel for

- HIGH STRENGTH • RESISTANCE TO CORROSION
- GOOD FORMABILITY • RESISTANCE TO ABRASION

J&L STEEL

Jones & Laughlin
STEEL CORPORATION – *Pittsburgh*

Jones & Laughlin Steel Corporation
Dept. 412, 3 Gateway Center, Pittsburgh 30, Pa.

Please forward a copy of your booklet, Jalten low-alloy, high-strength steel.

Name_____

Company_____

Address_____

SAFE CONTROL

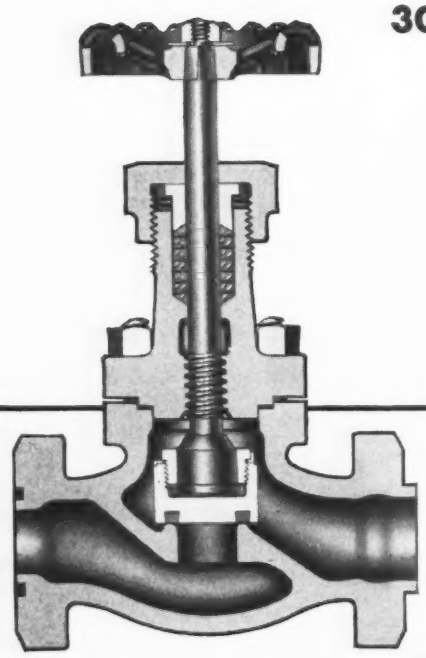
for ammonia and other hard-to-handle fluids

CRANE

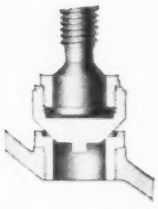
300-pound heavy-duty all-iron valves

Put these Crane valves to the test—use them for ammonia, air, oil, gas, caustic solutions, chlorinated compounds, alcohols—for chemicals and process work. Their rugged bodies of Ferrosteel (35% stronger than cast iron) . . . their precision seating designs . . . the unusually deep stuffing box and high-grade packing . . . the sweeping interior body contours . . . assure the safety and lasting service you want.

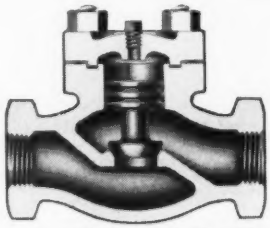
The line includes *bolted bonnet* globes and angles with choice of disc, *union bonnet* globes and angles with plug-type disc, lift checks, expansion valves, relief valves, liquid gauges—and all the fittings, flanges, return bends and other specialties for a complete Crane Quality installation. Check with your Crane man.



Cross-section bolted bonnet Globe, with flanged ends and special lead-faced disc. Sizes ¼ to 4-inch.



Bolted bonnet Globes also available with steel disc and seat where high temperatures or corrosion prohibit use of lead.



Cross-section, Lift Check with bolted cap, and cushioned disc action which increases valve life. Sizes ½ to 2-inch.

New 6-page folder AD1977 catalogs this complete Crane line. Write direct, or ask your Crane Representative.

THE BETTER QUALITY . . . BIGGER VALUE LINE . . . IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

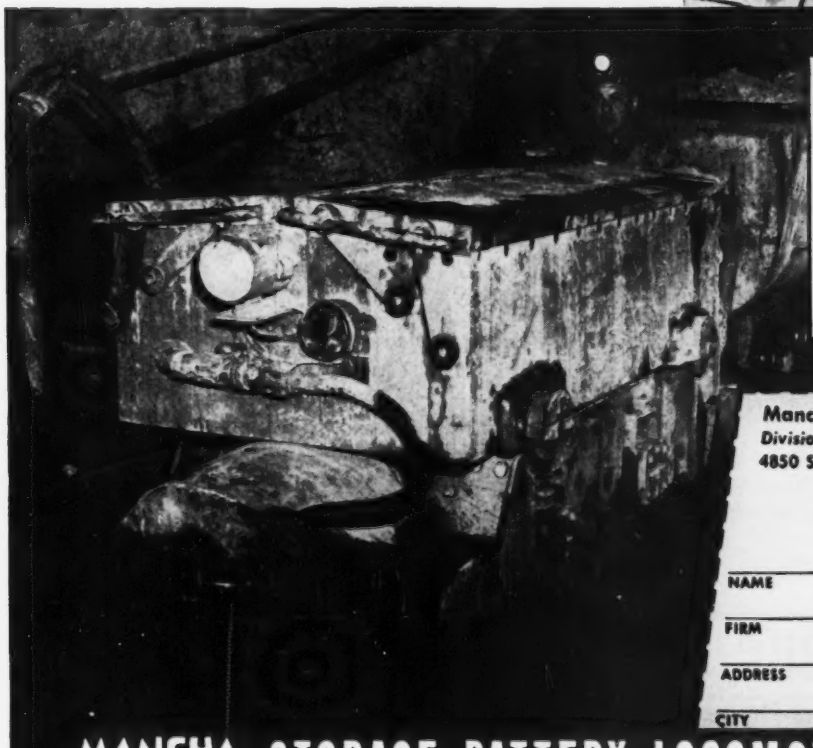
IF YOUR PROBLEM IS HAULAGE

write for MANCHA'S MINE HAULAGE DATA FORM It costs you nothing

This Data Form contains a carefully studied outline of questions concerning haulage systems. You fill it in, using the facts applying to your own conditions and requirements, then return it to us.

Without cost or obligation to you, Mancha engineers will analyze the information you submit, and tell you the maximum output that can be obtained in your mine with Mancha Storage Battery Locomotives. Then you can make your own comparisons.

Many a mine operator can trace a sharp upswing in his haulage efficiency to the analysis he obtained through Mancha's Mine Haulage Data Form service. Whether or not you are in the market for haulage locomotives today—SEND THE COUPON!



There's a Mancha Storage Battery Locomotive designed to exactly fulfill your haulage requirements. And you can depend on every Mancha for the uninterrupted service that spells steady production.

Mancha Storage Battery Locomotive
Division GOODMAN Manufacturing Company
4850 South Halsted Street, Chicago 9, Ill., U.S.A.
E&MJ - 254
Send your mine haulage data form.

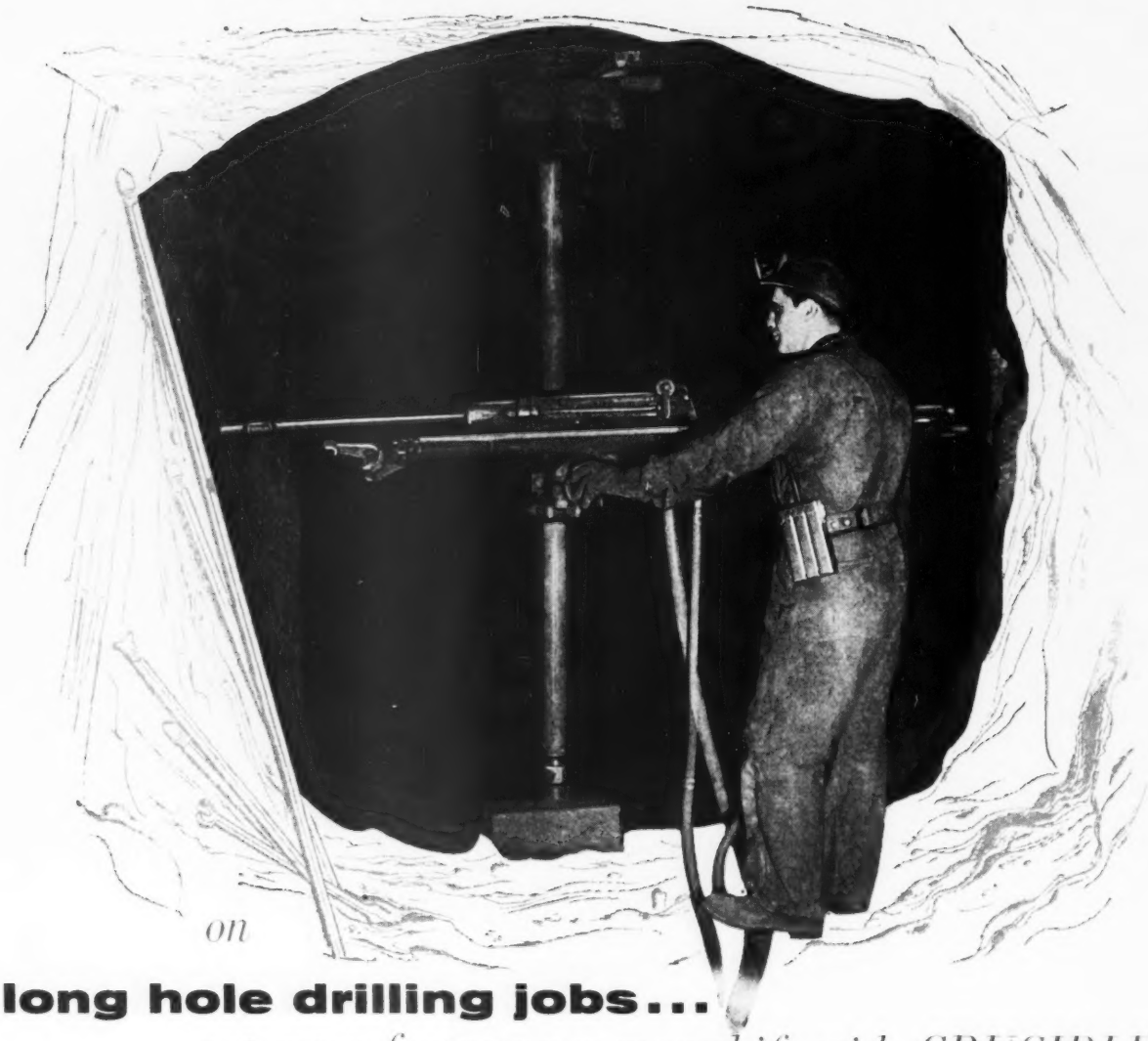
NAME _____

FIRM _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

MANCHA STORAGE BATTERY LOCOMOTIVE
Division **GOODMAN** *Manufacturing Company*
4850 SOUTH HALSTED STREET CHICAGO 9, ILL., U. S. A.



on

long hole drilling jobs...

get more footage per man-shift with CRUCIBLE

CA DOUBLE DIAMOND *Alloy Hollow Drill Rods*

Tungsten-carbide bits and heavy-duty rock drills have made deep-hole drilling possible. But just as important are the sectional steel rods that go between.

You can rely on Crucible's *CA Double Diamond* Alloy Hollow Drill rods to take the roughest jobs in stride . . . with less rod breakage . . . fewer lost bits. That's because they are manufactured to tool steel specifications, by Crucible — the leading producer of special purpose steels.

Each lot of *CA Double Diamond* is thoroughly tested by actual granite drilling. And each rod possesses a uniformly round, accurate hole that permits maximum water or air passage . . . an essential in successful long hole drilling.

For longer drill life and lower operating costs on your next long hole job, specify Crucible *CA Double Diamond* Alloy Hollow Drill Rods.

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking **HOLLOW DRILL RODS**

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • ALLOY • MAX-EL • SPECIAL PURPOSE STEELS

FEATURE

Wire Line Core Barrel Will Cut Drilling Costs (1)

USING THE NEW WIRE LINE core barrel recently introduced by E. J. Longyear Co., Minneapolis, Minn., drillers will not have to pull the string of drill rods out of the hole except to change the bit. In a 3000-ft hole, the new unit can save up to 3 or 4 hours required normally for a round trip.

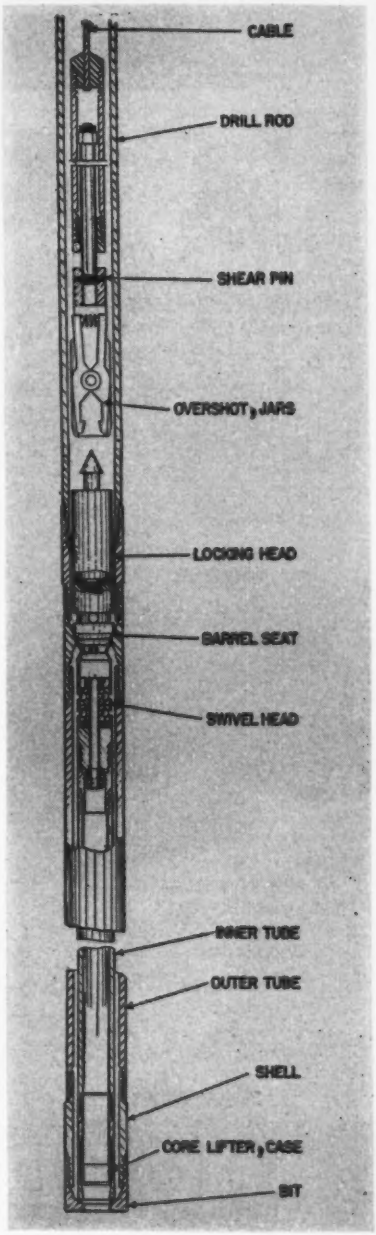
A number of BX holes have been successfully completed at depths ranging from 500 to 3200 ft. Currently a hole is being drilled in eastern United States with the wire line core barrel which is expected to reach a depth of 5000 ft.

Core recovered with this equipment is approximately 1 1/16 in. in diameter. At the end of each core run, the inner tube, together with the core lifter assembly and the core, is extracted from the hole through the inside of the drill rods by means of a wire line cable reel.

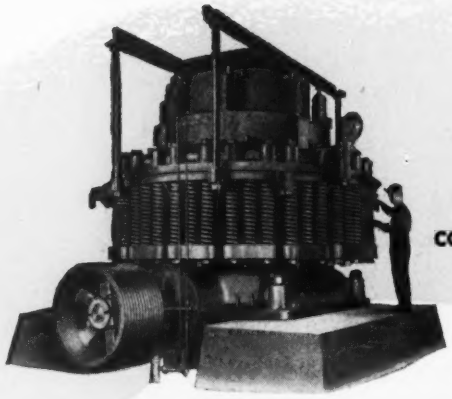
With skilled operators, extraction of the core-laden inner tube and lowering of the empty inner tube in a 1500-ft hole requires 15 to 20 min, as compared with 60 min for a round trip using conventional diamond core drill rods and core barrel. Round trip with wire line equipment in a 3000-ft hole, has been accomplished in 32 to 38 min, elapsed time, as compared with 3 to 4 hr required with conventional equipment.

The core barrel is equipped with a ball-bearing swivel-type head and, optional, if desired, a water shut-off valve. According to E. J. Longyear Co., this latter feature is of particular importance because, for the first time in the history of diamond core drilling, the human element has been largely eliminated in coring. The instant a core block occurs in the bit or inner tube, the water shut-off valve action prevents circulation of fluid, alerts the operator, and forces him to "pull" before core grinding starts. This results, the company claims, in vastly improved core recovery, decreased diamond loss and longer bit life.

For further information on the wire line core barrel, circle No. 1 on the postage-free reply card, opposite p. 42 and mail as early as possible. (1)

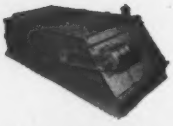


SYMONS* PRIMARY GYRATORY CRUSHERS



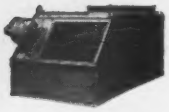
SYMONS* CONE CRUSHERS

SYMONS "V" SCREENS for extremely fine separation



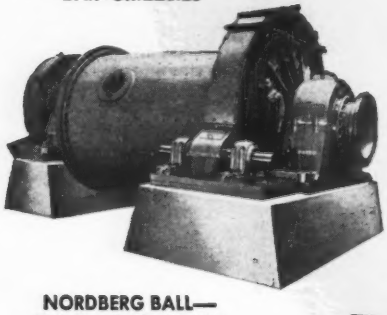
SYMONS* VIBRATING SCREENS

SYMONS* VIBRATING BAR GRIZZLIES



SYMONS* VIBRATING ROD GRIZZLIES

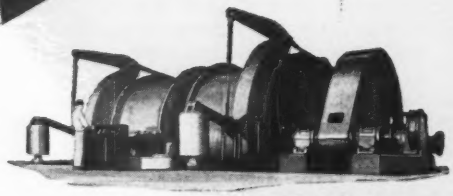
NORDBERG
MINING MACHINERY
... the leading choice of producers THE WORLD OVER



NORDBERG BALL— TUBE and ROD MILLS for wet and dry grinding

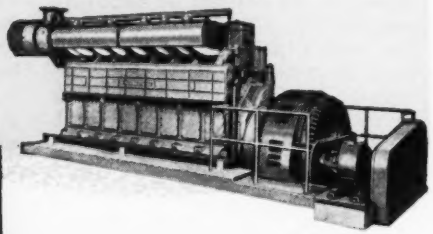
It is highly significant that wherever ores are found in quantity — efficiency-minded producers are now using, or are in the process of installing, Nordberg Mining Machinery . . . to assure maximum and continuous production at low operating and maintenance costs.

Write for literature on the machinery you need.



NORDBERG MINE HOISTS

NORDBERG DIESEL— DUAFUEL® and SPARK-FIRED GAS ENGINES from 10 to over 10,000 H.P. in a single engine.



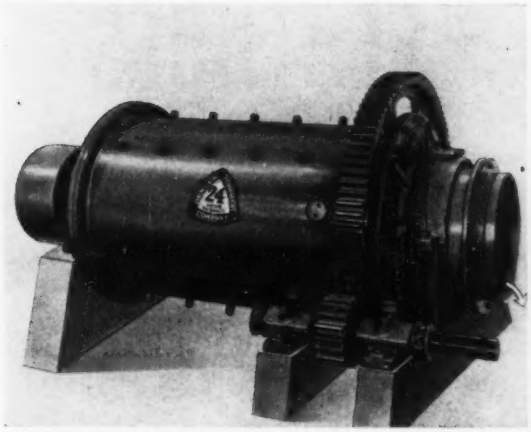
M153 **NORDBERG MFG. CO., Milwaukee, Wisconsin**

NORDBERG MACHINERY **NORDBERG** CRUSHERS SYMONS SCREENS NORDBERG

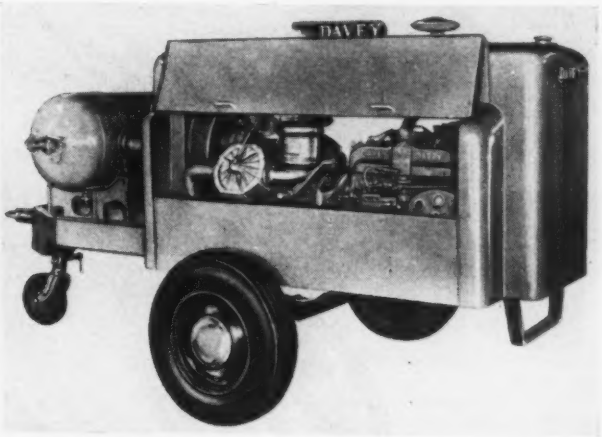
MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

NEW YORK • SAN FRANCISCO • DULUTH • WASHINGTON • TORONTO
MEXICO, D.F. • LONDON • PARIS • JOHANNESBURG

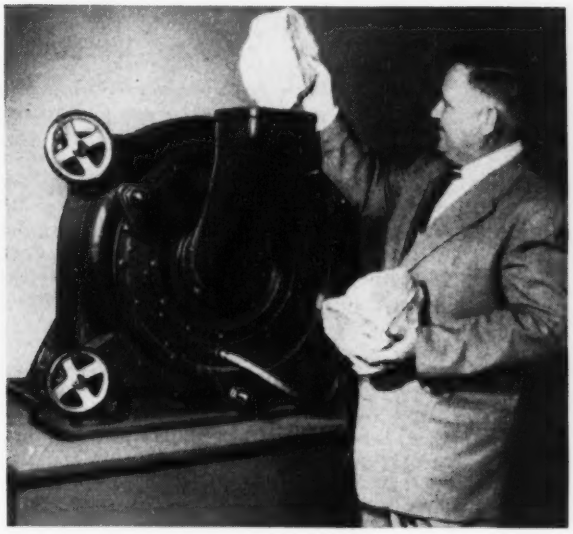
*SYMONS . . . A REGISTERED NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD

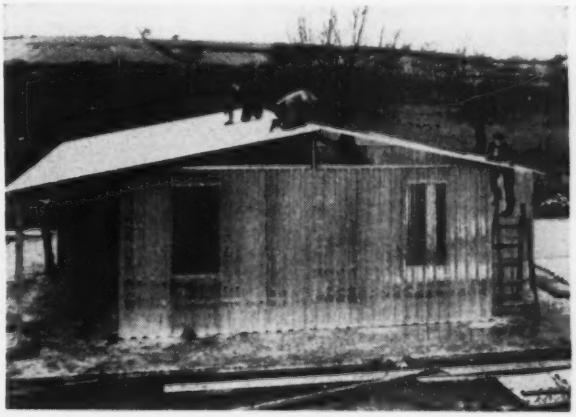


CONVERTIBLE BALL-ROD MILL is available in 4 sizes from 30 x 18 in. to 30 x 72 in. and length can be increased to 72 in. by increments of 18-in. sections. Discharge is easily changed. Denver Equipment Co. (2)



COMPRESSOR with 210 cfm capacity, mounted on 2-wheel trailer is 75 in. wide, 145 in. long; weighs only 3400 lb. Power is supplied by Hercules 6-cylinder engine. Davey Compressor Co. (3)





ALUMINUM HOUSING offers low priced dwelling that is fireproof, corrosion resistant. Two-room house weighs 865 lb.; 8-room house weighs 2300 lb. Unit is easy to erect. Aluminum Laboratories, Ontario. (5)

Turbo Mill Available in U.S.

A GERMAN-DEVELOPED Turbo-Mill is now reaching the U.S. market and engineers have been watching this new grinding and pulverizing machine in action at the plant of the A. E. Poulsen Co. in Los Angeles.

The Turbo-Mill is revolutionary in concept, radical in design. It uses all known principles of grinding and pulverizing (compression, impact, attrition, cutting and shredding), and in addition, a ricochet action.

Created by Ludwig Pallmann, of Zweibruecken, Germany, the Turbo-Mill is claimed to grind and pulverize a wider range of materials more efficiently, satisfactorily, faster and at lower cost than has been possible heretofore.

Employing a principle observed by Pallmann in nature, the Turbo-Mill duplicates the ricochet action of the wind pulverizing rocks and sand. Miniature wind storms of 360 fps are created and controlled within the Turbo-Mill.

This turbulence contributes to the disintegration of almost any material into finest powder.

For further information circle No. 17 on postage-free reply card opposite p 42 and mail as soon as possible. (4)

SHUTTLE CAR with 4000-lb. capacity, features 4-wheel steering, 4-wheel drive. Width, 76 in.; length 16.5 ft; height, 69 in. Hydraulic dump. HD-260 Continental engine. Speeds up to 20 mph. Getman Bros. (6)

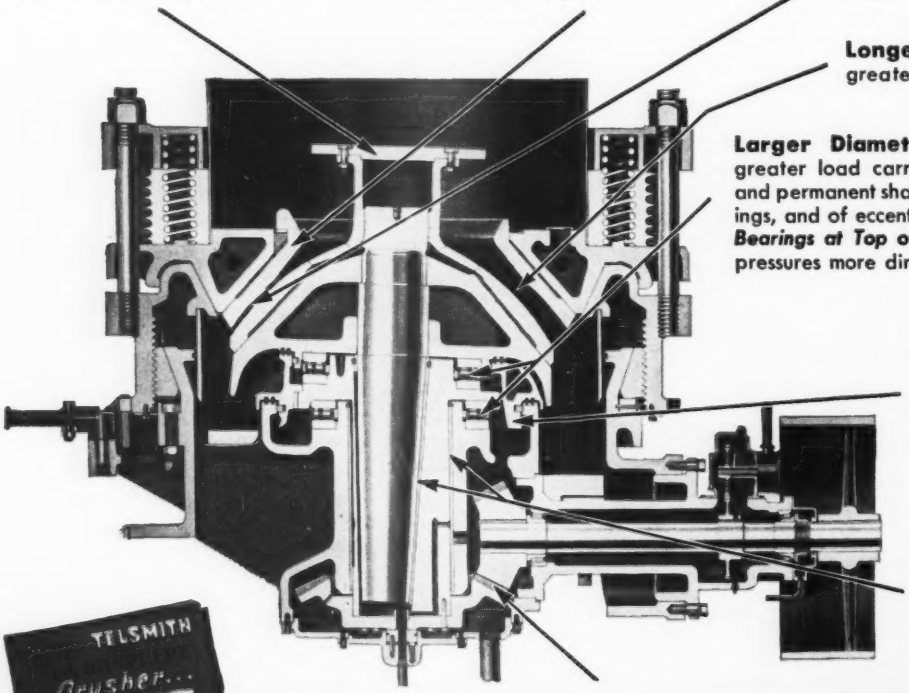
Outstanding FEATURES OF THE TELSMITH *Gyrasphere*®

Feed Distributor gives an even distribution of the feed around the entire feed opening, resulting in a more uniform crushed product.

Gun-Lock for Holding Concave Ring — Automatic self-tightening, requires no bolts, and is easier to change.

Longer Parallel Crushing Zone gives a finer, more uniform product with a larger percentage down to size.

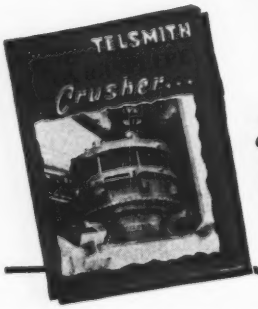
Longer Crushing Stroke gives greater capacity and less packing.



Larger Diameter Roller Bearings with greater load carrying capacity. Give perfect and permanent shaft alignment in eccentric bearings, and of eccentric in main frame. ***Both Roller Bearings at Top of Eccentric*** carry all crushing pressures more directly into heavy main frame.

Patented Rotary Seal with piston ring and labyrinth seals, gives most perfect protection against entrance of dust or water, or loss of lubricant.

Higher Eccentric Bearings give more bearing area in the upper zone of greatest crushing pressures, assuring more permanent shaft and eccentric alignment and longer bearing life.



Send for Bulletin No. 274

Main Drive Gear At Bottom of Eccentric assures more perfect and permanent alignment of gear and pinion, giving smoother running and longer life for both gear and pinion and less strain on countershaft bearings.

Y-12

STYLE FC
FINE CRUSHING

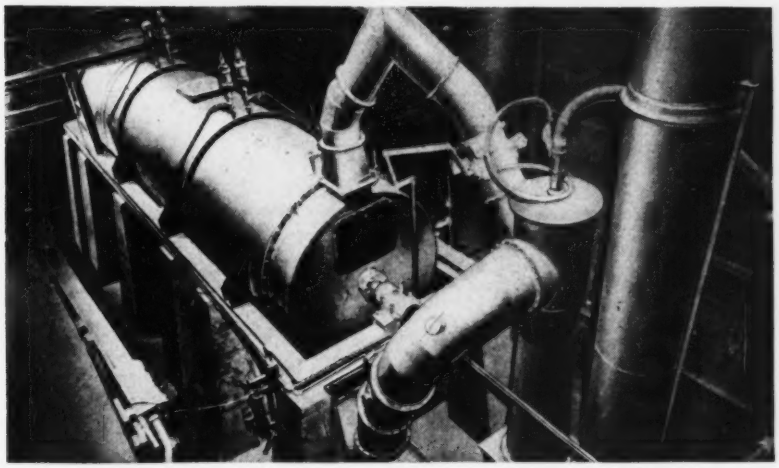
SMITH ENGINEERING WORKS, 502 E. CAPITOL DRIVE, MILWAUKEE 12, WISCONSIN

Cable Address: Sengworks, Milwaukee

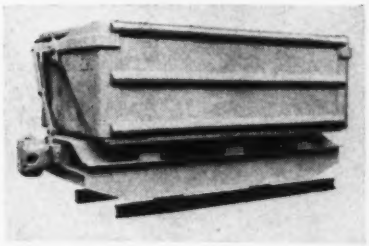
Samuel Osborn (S. A.) Ltd., Johannesburg, So. Africa • 51 East 42nd St., New York 17, N. Y. • 211 W. Wacker Dr., Chicago 6, Ill.

W. B. Thompson Co., Iron Mountain, Mich. • Berry, Inc., Duluth 2, Minn. • Mine & Smelter Supply Co., Denver 17, Colo. • Fowler Eqpt. Co., Salt Lake City 8, Utah • Mines Eng. & Eqpt. Co., San Francisco 4, Calif.

Robert S. Bailey, Los Angeles 17, Calif. • Ontario Eqpt. & Supply Ltd., Toronto, Canada • Gordon Russell, Ltd., Vancouver, B. C.



LIME HYDRATOR, in 3 months' full scale operation has hydrated virtually 100% of magnesium in feed as compared with normal 27% loss. Heat released in initial calcium hydration stage is returned to hydrator to serve as catalyzer in magnesium hydration. Remarkable degree of heat balance and close temperature control are thus possible. Kennedy Van Saun Mfg. & Eng. Corp. (7)

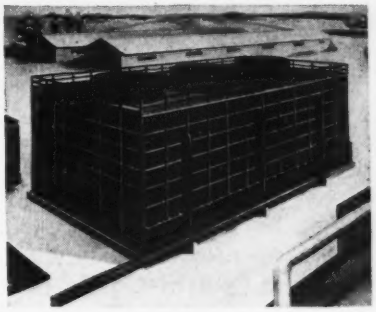


MINE CAR

Numerous advantages are claimed for the Granby car built by Sanford Day Iron Works, Knoxville, Tenn., because of its outside frame undercarriage, outside spring truck boxings, automatic coupling mounting and other important design features. For details, circle No. 8 now. (8)

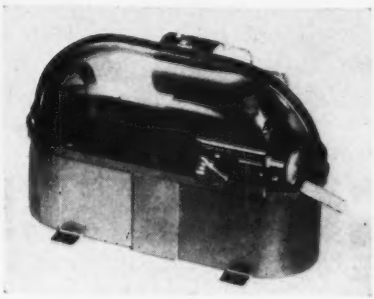
KNUCKLE BANDAGE

If you insist on cutting, banging or otherwise damaging your knuckles, finger tips, elbows, toes, heels or other tough spots to bandage, then the photograph above will show you how handy it would be to have some elastic "Knuckle Bands" around. E. D. Bullard Co., San Francisco, Calif., puts them up in unit packs of 8 or 16 in boxes of 50 or 100. (9)



COOLING TOWER

Two advantages are claimed for the MD-54, a new type cooling tower developed by Santa Fe Tank & Tower Co., Los Angeles, Calif. Fewer construction parts means a saving on erection and maintenance. A bracing system which provides minimum obstruction to free flow provides a better cooling performance. (10)



REAGENT FEEDER

Clarkson Co., San Francisco, Calif. is now making its Model E reagent feeder available in unplasticized poly-

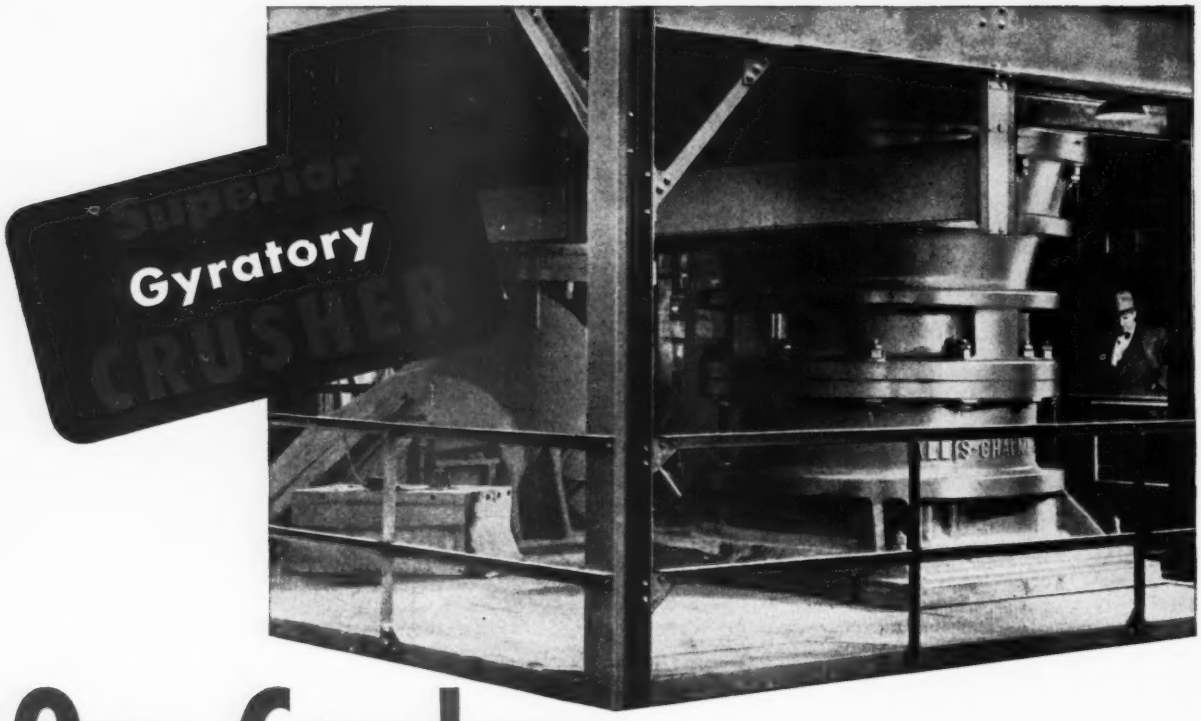
what's NEW in Engineering

A triple threat fire truck to fight oil field fires is reported to have been perfected by the Seagrave Corporation of Columbus. Unlike ordinary fire-fighting apparatus, the new truck is designed to snuff out oil field and refinery fires any one of three ways; by squirting out 2800 gallons of water a minute, 1300 pounds of dry chemical compounds, or 19,000 gallons of fire-smothering "foam". In an emergency, all controls on the 20,600 pound unit can be operated by one man.

To utilize low grade ores previously stockpiled, Kaiser Engineers has designed and built a new beneficiation plant at Eagle Mountain Mine, California. The new plant will increase the iron content of the ore shipped and thus further reduce the operating costs of the West's only completely integrated steel plant, 163 miles away. Incidentally, 51 miles of this distance is over the standard gauge railroad designed by Kaiser Engineers to cross the Southern California desert and connect the mine with the tracks of the Southern Pacific.

Temperature Measurement in Engineering, described as a "how to" book for the proper design, performance, and operation of temperature measurement installation, has just been published by Wiley. The authors of the new book are H. Dean Baker, E. A. Ryder and N. H. Baker.

Kaiser Engineers has a large staff of engineering and construction experts ready to tackle your problems in all fields of design, engineering and construction. Call or write: Kaiser Engineers Division of Henry J. Kaiser Company, Kaiser Building, Oakland 12, California.



One Crusher... Does Work of Two!

HOMESTAKE MINING Company installed a modern 30-55 *Superior* gyratory crusher to replace two old *Gates* gyratories. Despite the fact that the new crusher has a 30-inch feed opening, instead of a 17-inch opening as on the old crushers, it fits snugly into half the former space for two. The *Superior* can turn out much more tonnage than both old crushers. And it's built to surpass the 38-year service record of the old crushers.*

This increased capacity and improved performance is a direct result of over 70 years of experience in building crushers, years in which Allis-Chalmers leadership introduced many design advantages in gyratory crushers — the short mainshaft . . . improvements in the shape and size of the crushing chamber, in weight distribution, in dust protection and lubrication. These and other features mean more *profitable* crushing for you, when you specify Allis-Chalmers!

A-4195

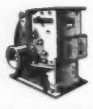
For more facts on *Superior* primary or secondary crushers, call the Allis-Chalmers representative in your area or write Allis-Chalmers, Milwaukee 1, Wisconsin for Bulletin 07B7870.

**Yes, the old* Gates *crushers were built by Allis-Chalmers too — back in 1913!*

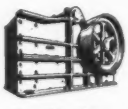
Superior and *Gates* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

Sales Offices in Principal Cities in the U. S. A. Distributors Throughout the World.


Hammermills

Vibrating Screens

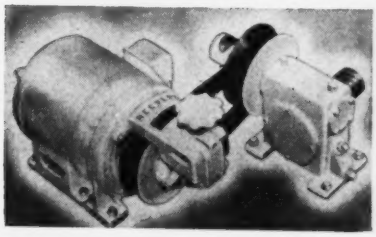

Jaw Crushers

Gyratory Crushers

Grinding Mills

Kilns, Coolers, Dryers

vinyl chloride for use where exceptionally good corrosion resistance is demanded. (11)

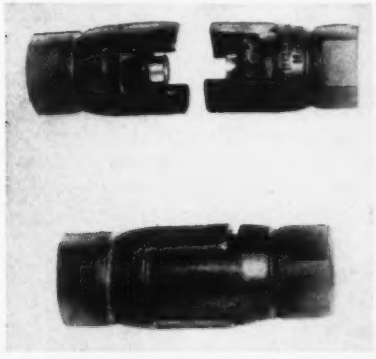


VARIABLE SPEED DRIVE

New low speeds make the "Flexi-Speed" drive (Reeves Pulley Co., Columbus, Ind.) especially adaptable at recommended speeds to practically any gear reducer, either worm or helical. The maker claims it also has many more applications without a reducer. (12)

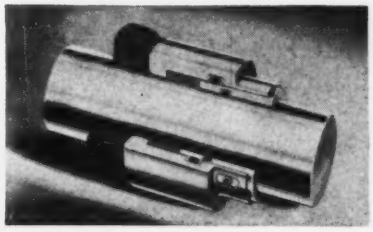
VALVE RESEATING KIT

Save money by reseating your worn valves yourself. Circle No. 13 on the New Products Digest reply card to get literature on the Skinner-Seal valve and bibb reseater. M. B. Skinner Co., South Bend, Ind. (13)



AIR HOSE COUPLING

Two-way hose coupling has built-in valve for positive shut-off of air pressure when disconnecting hose. Makes the changing of air tools faster and safer according to the manufacturer, Twinmatic Corp., Los Angeles, Calif. (14)



MECHANICAL SEALS

Simplicity of design is the feature of new "O" ring mechanical seals made by Garlock Packing Co., Palmyra, N. Y., for rotating pump shafts. Small number of moving parts affords easy manufacturing adaptability of seal to withstand any liquid, whether hazardous or corrosive. (15)

DUMPING MECHANISM

Rotary dumping mechanism made by Automatic Transportation Co., Chicago, Ill., slips readily onto forks of this lift truck, coverting it from fork operation to dumping operation in less than 20 minutes. (16)

BUTTERFLY VALVE

A resilient neoprene seat is the feature of butterfly valve designed for low pressure service with the ability to hold a pressure or vacuum and also be able to shut off completely against suspended solids. Keystone Tool Corp., Texas. (17)

Use postage-free reply card opposite p 42 for further information

ARE YOU DATED?

ARE YOU still plodding along with a "horse & buggy" surveying instrument?

PROGRESSIVE SURVEYORS use modern WILD instruments for matchless precision and operational speed . . . for Substantial MAN-HOUR SAVINGS!

★ ★ ★

Set Yourself "Up to DATE"
MAKE A DATE WITH OUR DEMONSTRATION STAFF to handle a modern WILD instrument. We will arrange to show you the unmatched performance of WILD Transits, Theodolites, Levels and other surveying equipment...in action under field conditions.

★ ★ ★

® WILD HEERBRUGG has THE MOST SUITABLE modern surveying instrument for your specific job or for universal application. WILD instruments are known throughout the world for:

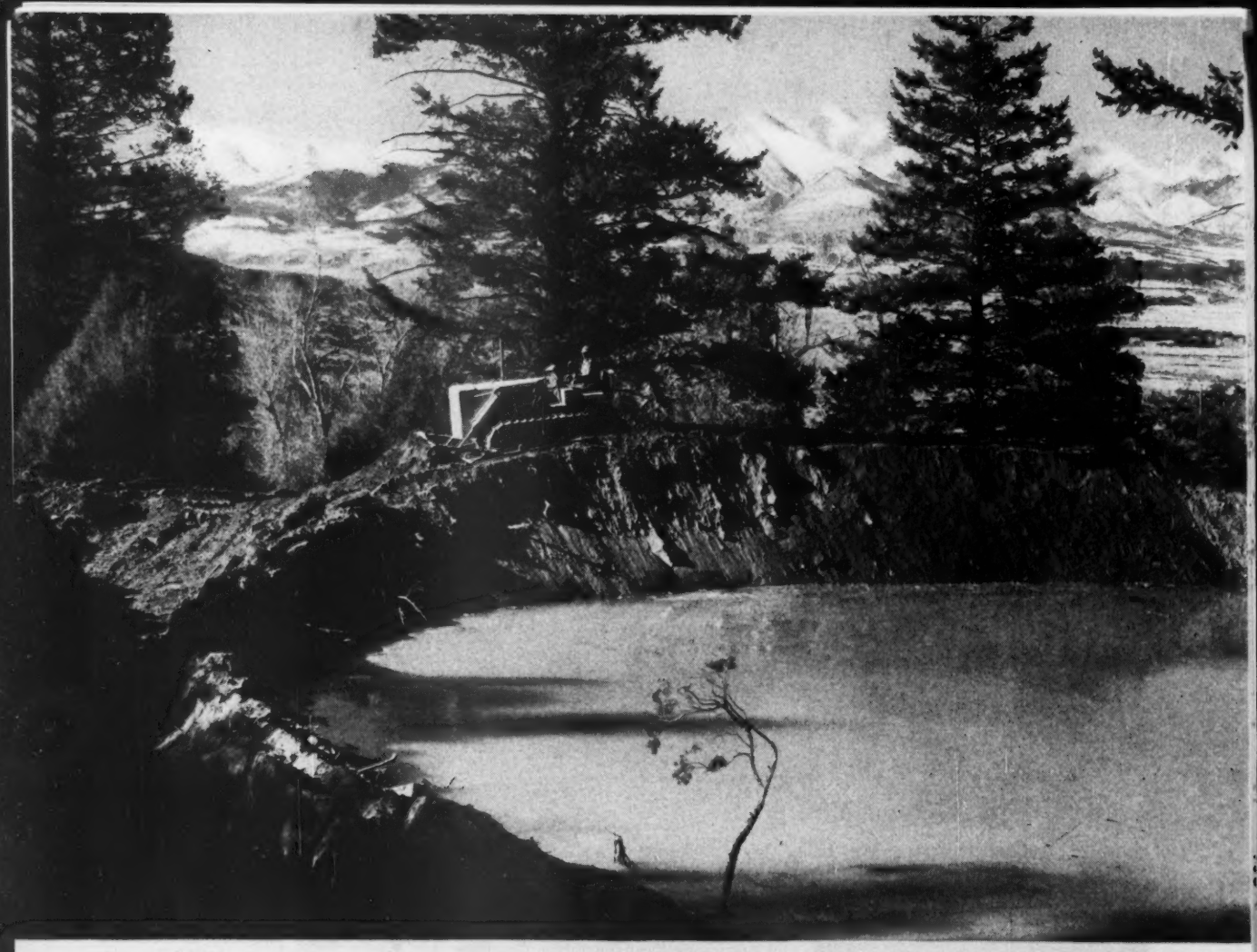
- ★ Ease and speed of handling
- ★ Fool-proof design and maximum reliability
- ★ Lasting trouble-free operation
- ★ Light-weight, rugged construction
- ★ Simplicity of collimation and level vial adjustments

See For Yourself! Contact Dept. EM 2

MAKE A DATE WITH WILD...the world's largest manufacturer of precision surveying instruments.

Extensive repair and servicing facilities by factory trained specialists.

HENRY WILD
SURVEYING INSTRUMENTS SUPPLY CO.
OF AMERICA, INC.
MAIN & COVERT STS., PORT WASHINGTON, N. Y.
POrt Washington 7-4843



High in mountains near Poncha Springs, Colo., this Caterpillar D6 Tractor with No. 6A Bulldozer, owned by Reynolds Mining Corp., constructs a new fluorspar settling pond. Fluorspar will be used in Reynolds' Alexander, Ark., aluminum plant. Across valley are beautiful Collegiate Peaks, near famed Leadville mining district.

ON TOP OF THE WORLD...ON TOP OF THE JOB

Even in tough going like this, the Cat* D6 Tractor stays on top of the job. At about 8,000 feet altitude, it 'dozes rocks and dirt—much of the latter frozen—in temperatures that range from summer heat to far below zero.

High altitude is a difficult test of an engine, but the rugged Caterpillar-built Diesel Tractor delivers plenty of power to do rough jobs fast. It's built to keep working for you for many thousands of hours without down time or tinkering, thanks to sturdy construction, specially hardened cylinder liners, long-wearing aluminum-alloy bearings, and efficient oil and air filtration.

The versatile No. 6A angling blade can drift material over banks as well as do straight 'dozing. Scientific curving of the moldboard permits big, rolling, fast-moving loads. This means you get more work per hour—*more work per dollar*—from a Cat-built Bulldozer.

Many jobs around mines are equipment-busters. That's why you need the extra, built-in *toughness* of Caterpillar machines. Your Caterpillar Dealer will gladly show you, on the job, the tractor and matched bulldozer that will do most for you at lowest cost. Your dealer backs his products with fast, skilled service and genuine factory parts.

Caterpillar Tractor Co., Peoria, Illinois.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®

NAME THE DATE... YOUR DEALER WILL DEMONSTRATE

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

DUAFUEL ENGINES. Three-color, 16-page bulletin (202) on design, construction, operation, and application of Nordberg two-cycle Duafuel engines is announced by Nordberg Mfg. Co. (31)

MATERIALS HANDLING COSTS. A revised edition "The HOW Book of Cost-Cutting Materials Handling"—incorporating latest methods for analyzing materials handling operations in plants and warehouses—is now available from the Yale Materials Handling Div., The Yale & Towne Mfg. Co., Philadelphia, Pa. (32)

SPECTROPHOTOMETRY SIMPLIFIED. A down-to-earth review of one of today's most exciting new sciences is found in the color-illustrated booklet, "What Every Executive Should Know About Spectrophotometry," released by Beckman Instruments, Inc., South Pasadena, Calif. It presents for the first time the whole story of spectrophotometry—a technique for analyzing unknown substances by measuring amount of light they absorb. (33)

LITHIUM. Guide book on lithium and its compounds is now available from Foote Mineral Co., Philadelphia, Pa. Contains many new ideas and new applications of lithium chemicals, as well as complete coverage of current commercial applications. (34)

NEW THOR ELECTRIC TOOL CATALOG. A 40-page catalog of portable electric power tools has been announced by Thor Power Tool Co., Aurora, Ill. Catalog No. 39-A, gives complete illustrations, descriptions, specifications, and prices on all Thor tools. (35)

CONVEYOR IDLERS. More than 500 belt conveyor idlers in 34 types, designed to meet practically every requirement, are pictured and described in a 48-page book No. 2416, just released by Link-Belt Co., Chicago, Ill. Engineers concerned with conveyors should have this one. (36)

HARDFACING. Amsco's complete line of hardfacing and build-up rods and electrodes are fully described in a 48-page, 2-color catalog. Typical applications are shown in over 70 photographs and full metallurgical and physical properties are included for the four automatic and fifteen manual rods and electrodes. There is also a complete technical section with charts and photographs to help you select the correct hardfacing rod for those unusual or hard-to-solve wear problems. American Manganese Steel Div., Chicago Heights, Ill. (37)

RUBBER BEARINGS. An illustrated catalog which describes use and advantages of B. F. Goodrich Cutless rubber bearings in industrial equipment, including milling equipment, and placer dredges, is available through Lucian Q. Moffitt, Inc., Akron, Ohio, national distributors. Contains engineering data and recommends use of Cutless rubber bearings in various types of equipment such as pumps, agitators and similar equipment where bearings can be lubricated with water or by the liquid handled in the equipment. (38)

ELECTRONIC WEIGHING. How to weigh contents of tanks, bins and hoppers electronically with Baldwin SR-4 load cells is explained in Bulletin 4106, an 8-page, illustrated brochure issued by Baldwin-Lima-Hamilton Corp., Philadelphia, Pa. (39)

V-BELTS. R/M Super-Power V-Belts are described in Bulletin No. 6628 issued by Raybestos-Manhattan, Inc., Manhattan Rubber Div., Passaic, N. J. Nine advantages are outlined in detail. Among other features is a complete list of sizes and new belt numbers applicable to Super-Power V-belts. (40)

WIRE ROPE. Seventeen "life-saving" tips for improving wire rope service are given in a new folder offered by Leschen Wire Rope Div., entitled "How to Get More Work Out of Your Wire Rope." Copies are available from Leschen Wire Rope Div., H. K. Porter Co., Inc., St. Louis, Mo. (41)

HARDFACING. A production method to lower maintenance and replacement costs, is presented in a colorful 4-page booklet published by Cleveland Hard Facing Inc., Cleveland, Ohio. It describes the method of applying hard alloy metal to a low alloy steel base at areas of wear and illustrates how operating life of worn equipment is increased by hardfacing. (42)

FEEDERS. Hardinge Co., Inc., York, Pa. has a 12-page catalog (Bulletin 33-E) covering design details, capacities, dimensions and application of Hardinge constant-weight feeders, weight-measuring feeders, volumetric belt-feeders, disc feeders and volumetric non-flooding drum feeders. (43)

SCREENS, FEEDERS, CONVEYORS. Simplicity Engineering Co., Durand, Mich. has a 28-page illustrated catalog describing their complete line of screens, feeders and conveyors.

JET CLEANERS. Comprehensive, 8-page bulletin on hydraulic jet cleaners, operated by ordinary steam and cold water lines, explains the function of this low cost, heavy duty cleaning method and indicates many applications. Sellers Injector Corp., Philadelphia, Pa. (45)

BLASTING. A 28-page booklet, in Spanish for the benefit of South and Central American mine, quarry and

USE THIS CONVENIENT CARD

to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, tear out and mail.

Not good after April 1, 1954, if mailed in the U.S. or Canada.

Engineering and Mining Journal—February, 1954
NOT GOOD AFTER APRIL 1, 1954—If mailed in U. S. or Canada

Please send me the catalogs or further information about the items from New Products Digest whose numbers are circled.

1	8	15	22	29	36	43	50	57	64	71	78	85	92
2	9	16	23	30	37	44	51	58	65	72	79	86	93
3	10	17	24	31	38	45	52	59	66	73	80	87	94
4	11	18	25	32	39	46	53	60	67	74	81	88	95
5	12	19	26	33	40	47	54	61	68	75	82	89	96
6	13	20	27	34	41	48	55	62	69	76	83	90	97
7	14	21	28	35	42	49	56	63	70	77	84	91	98

My Name ..... Position .....

Company .....

Address .....

construction engineers, explains in detail the millisecond delay or Rockmaster system of blasting developed by the Atlas Powder Co., Wilmington, Del. Dominating the more than 50 illustrations are many sequence photographs of actual blasts captured with the company's automatic camera which shows development of a blast and the progression of rock movement with a clarity hitherto unobtainable. ¡Muy interesante! (46)

VIBRATING SCREENS. Bulletin No. 55, giving complete information on Deister Heavy-Duty Types ETP (end tension, pillow-block) and ETU (end tension, unitized) high, speed vibrating screens, has been released by the Deister Machine Co., Fort Wayne, Ind. (47)

WIRE ROPE FITTINGS. Sauerman Bros., Inc., have a 6-page brochure containing blueprint drawings, tables and ordering information on open and double wedge sockets, pins and continuous cable clamps. (48)

CORE BARREL. Bulletin No. 330, issued recently by Sprague & Henwood, Inc., contains more information regarding their series "M" core barrel than has heretofore been available in print. According to the company the Series "M" core barrel, used in conjunction with the Series "M" coring bit, permits a higher percentage of good core from fractured, porous, or soft formations than would otherwise be possible. (49)

THAWING PITS. Bulletin No. 1041 describes how to solve the winter problem of thawing frozen railroad hopper cars of coal, limestone, ores, etc., with radiant heat. This method avoids direct flame contact and car damage. One man has operated 12 pits at a time. Hauck Mfg. Co., Brooklyn, N. Y. (50)

GEARMOTORS. A 15-page booklet (B-5645) describing the complete line of Westinghouse Life-Line gearmotors is available from the Westinghouse Electric Corp., Pittsburgh, Pa. (51)

HYDRAULIC CATERPILLAR CONTROLS. Three types of Caterpillar hydraulic controls, both front and rear mounted, available for the operation of scrapers, shovels, loaders, tool bar arrangements are discussed in a recent publication by Caterpillar Tractor Co., Peoria, Ill., entitled "Caterpillar Hydraulic Controls." (52)

TRANSFORMERS. Illustrating typical examples of a wide range of dry-type transformers for industrial use, a new 2-color brochure, complete with illustrations, diagrams and descriptions of their line of manufacture has just been issued by Jeffries Transformer Co., Los Angeles, Calif. (53)

TRACTOR. Packed with facts, 32-page Booklet 30379 entitled "Caterpillar Diesel D6 Tractor", has been released by Caterpillar Tractor Co. The booklet is highlighted by a double-page detailed cutaway of the D6 Tractor. In addition to a specification sheet and attachment list, the booklet suggests other equipment that may be used with the D6 Tractor. (54)

WATER HOSE. To help you select the best water hose for your specific need Quaker Rubber Corp., Philadelphia, has a full-color bulletin describing the many types of Quaker water hose now available. (55)

WIRE ROPE. Stretching the life span of wire rope is the subject of "Wire Rope—Use and Abuse", issued by the E. H. Edwards Co., South San Francisco, Calif. The illustrated pamphlet lists some of the common abuses of wire rope and how to prevent them. (56)

AIR HYDRAULIC CYLINDERS. In Bulletin No. 800, prepared by Lindberg Engineering Co., Chicago, Ill., the standard catalog line of heavy duty air and hydraulic cylinders are described in detail along with the features of each. (57)

ANVILS. Pocket-size booklet contains 18 pages of illustrated data on types, uses, designs and specifications of anvils, plus typical range of stock patterns, availability and methods of production. Fisher & Norris, "Eagle" Anvil Works, Trenton, N. J. (58)

CRANE-EXCAVATOR SELECTION. Wayne Crane Div., of American Steel Dredge Co., Inc., Fort Wayne, Ind. announces a pocket-size technical booklet entitled, "Handbook of Data for Proper Selection of Crane-Excavators." Contains specific information on major design and construction fundamentals, presented in a concise, matter-of-fact style. Actual comparison charts are included for added reading convenience. (59)

MOTOR CONTROL. Limitamp high-voltage motor control, its operation and application are described in a new 16-page picture-story booklet announced as available from the General Electric Co., Schenectady 5, N. Y. (60)

HOSE. "Dangers Under Pressure" is a worthwhile safety booklet available from Hose Accessories Co., Philadelphia, Pa. Prepared for the benefit of all hose users, it should aid them in securing longer trouble-free service life of both hose and couplings. Above all it may help avoid serious accidents. (61)

POWER TRANSMISSION. This 8-page bulletin has plenty of tables to aid you in selecting flexible couplings, variable speed pulleys and transmissions and universal joints made by Lovejoy Flexible Coupling Co., Chicago, Ill. (62)

TRAMP IRON DETECTOR. How to use "Detramp" for spotting tramp iron and how it works, are clearly explained with diagrams in bulletin 53A from Industrial Physics and Electronics Co., Salt Lake City, Utah. (63)

UNDERGROUND CORE DRILLS. Bulletin 340 from Sprague & Henwood, Inc., illustrates and describes two sizes of air-operated machines for core or blast-hole drilling and gives complete working data. (64)

FIRST CLASS
PERMIT NO. 64
(Sec. 34.9, P.L.&R.)
NEW YORK, N. Y.

BUSINESS REPLY CARD
No Postage Stamp Necessary If Mailed In The United States

Postage Will Be Paid By—

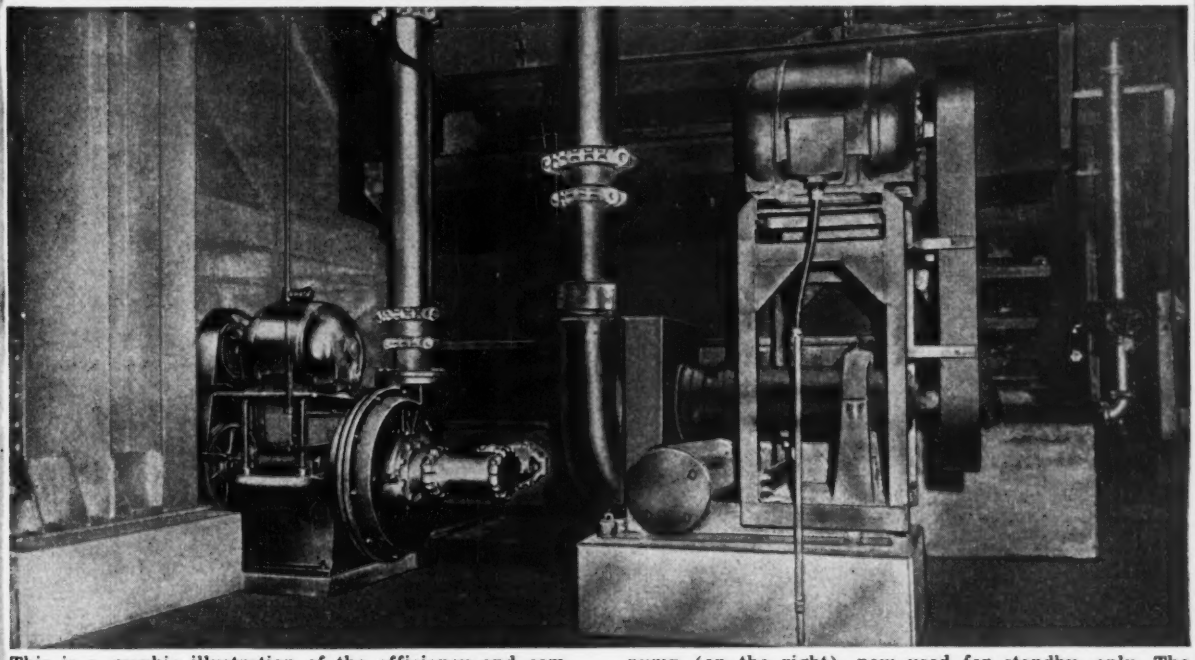
McGRAW-HILL PUBLISHING CO., INC.
ENGINEERING & MINING JOURNAL
330 WEST 42nd STREET
NEW YORK 36, N. Y.

USE THIS CONVENIENT CARD

to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, on reverse side, tear out and mail.

DENVER SRL PUMPS

Complete Milling Equipment—from testing, to feeder, to dryer!



This is a graphic illustration of the efficiency and comparative size of Denver SRL Sand Pumps. The 6"x6", 15 h.p. Denver SRL Sand Pump on the left replaced a 6" sand pump (on the right), now used for standby, only. The Denver SRL Pump handles 2,000 tons of classifier overflow per 24 hours, at 45% solids.

Long Service By Denver SRL Sand Pumps Means Less Maintenance Time, More Profits

Long service life and low maintenance on Denver SRL Sand Pumps mean maximum, continuous production and more profits. One to four years of continuous service, with original parts, on —⅛" pulp or below is common with these Denver pumps. This long, profitable service is possible because the rubber lining in Denver SRL Sand Pumps resists abrasion, cuts, tears and blisters.

SPECIALLY BONDED RUBBER LINING

Rubber linings and runners of the Denver SRL Pumps are specially bonded to steel skeletons by an exclusive pressure molding process. This process prevents the resilient, wear-resistant rubber from pulling away from the skeleton forms. You thus have wearing parts with up to 50 times longer life than parts of hardest alloy iron. The high resilience of the rubber is important. Passage of tramp up to 3" without stalling the pump has been reported. Rubber can even be punctured without efficiency loss.

HIGH EFFICIENCY, LOW HORSEPOWER

Pressure molding on all parts is extremely accurate so you get maximum efficiency. Efficiency is as high as 70%, which is 1½ to 3 times the efficiency possible with cast parts of ordinary iron or steel. Generally the Denver SRL Sand Pump requires less than one-half the brake horsepower required by other sand pumps in similar service.

SIMPLE CONSTRUCTION

There are less than 25 main parts in this pump. Operation and maintenance are easy. Rubber casings and runners are quickly changed so standby pumps are unnecessary. The pump requires very little sealing water.

Write or wire today. Find out how you can increase your profits and get more economical, efficient, longer, continuous service with a Denver SRL Sand Pump — sizes 2"x2" to 10"x8", capacities up to 2,500 g.p.m. @ 60% solids, stock deliveries subject to prior sale.

Free Technical Bulletin Sent on Request

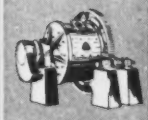
Over 25 years of Flotation Engineering

DENVER EQUIPMENT COMPANY

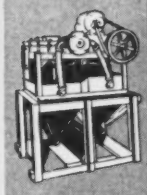
1400 SEVENTEENTH ST. DENVER 17, COLORADO

DENVER DISC FILTER

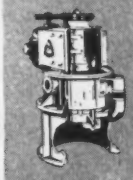
DENVER JAW CRUSHER



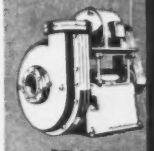
DENVER STEEL HEAD BALL MILL



DENVER MINERAL JIG



DENVER VERTICAL PUMP

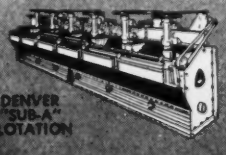


DENVER SRL PUMP

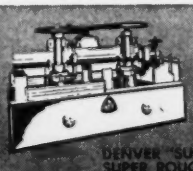
DENVER AUTOMATIC SAMPLER

DENVER STEEL HEAD ROD MILL

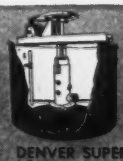
DENVER ORE FEEDER



DENVER "SUB-A" FLOTATION



DENVER "SUB-A" SUPER ROUGHER FLOTATION MACHINE



DENVER SUPER AGITATOR AND CONDITIONER

DENVER "SUB-A" UNIT CELL

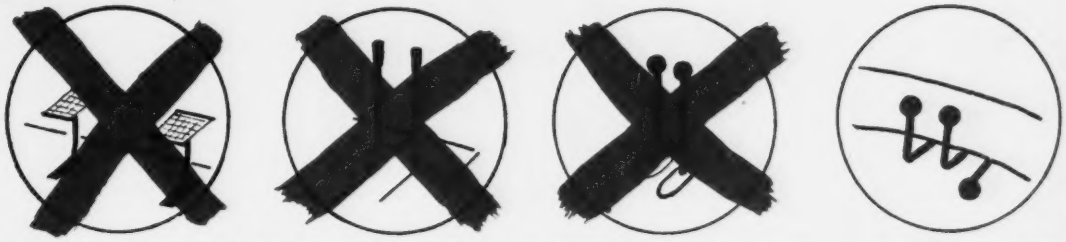
DENVER DIAPHRAGM PUMPS

DENVER DILLON SCREEN

Nine yards a minute is fast loading, and you can do it with the Eimco 105. You can dig and load most ordinary materials without preliminary breakage.

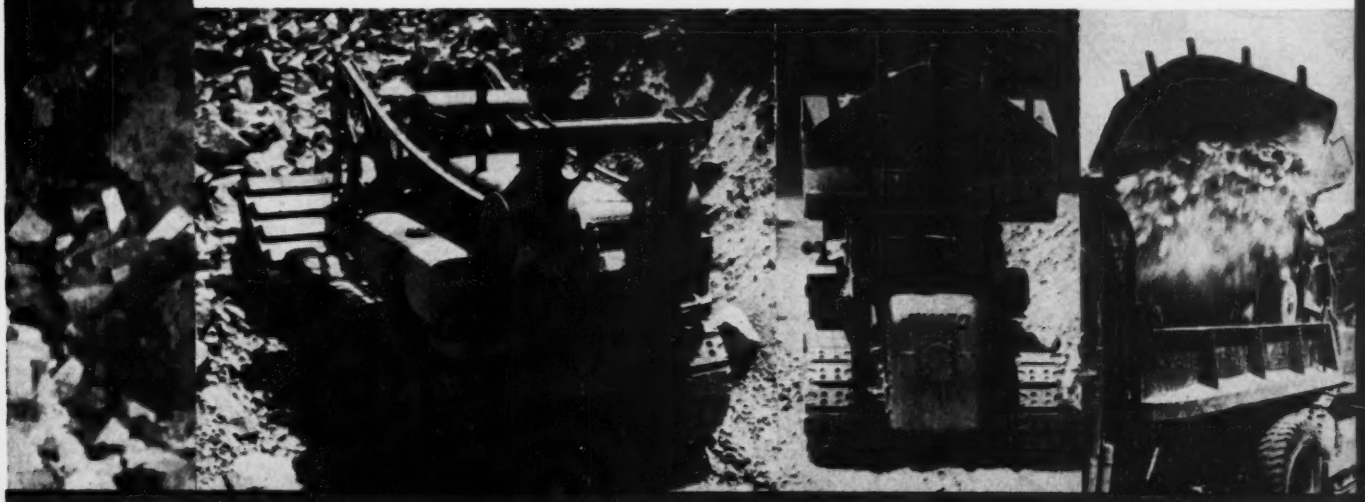
The Eimco 105 is primarily an excavating machine with ability to load consolidated material. It will handle many jobs previously assigned to heavy cumbersome machinery costing several times the price of the 105.

Steel castings and steel construction throughout make the 105 rugged and dependable. It is truly the first crawler unit designed to work under the added thrust and weight loads applied by the numerous attachments now available for contractors and industry that are accepted as part of the prime movers they buy. Its all steel construction makes it resist breakage from impact or abrasion which all machines encounter in normal working.



The 105 is a modern tractor, designed to meet the needs of modern, up-to-date machinery users. The need of clutch pedals has been eliminated, the use of steering brakes has been removed and the need for shifting transmissions by hand is no more. The Eimco 105 works smoothly and efficiently with two small levers which control the tracks on their respective sides. The 105 may be shifted from forward to reverse independently on either track with no clutching — no shifting. Turns can be accomplished by twisting one lever to forward position and the other to reverse to provide spin turns, or longer turns can be effected by proper manipulation of these same handles. Gear changing is done with a separate small handle which may be actuated at any time during the operation of the machine.

The cycle of the loading unit is fast (see below) — digging or excavating is forward, discharge is overhead to the rear. Complete cycles from digging position to digging position average 10 to 15 seconds, which will permit loading of 6 to 9 yards per minute depending on material being loaded and travel distance.

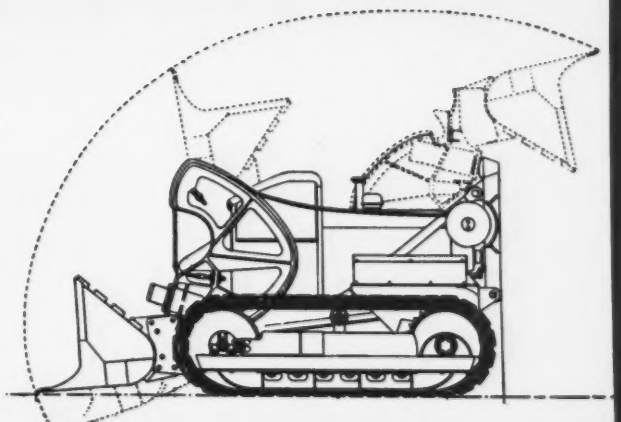


EIMCO

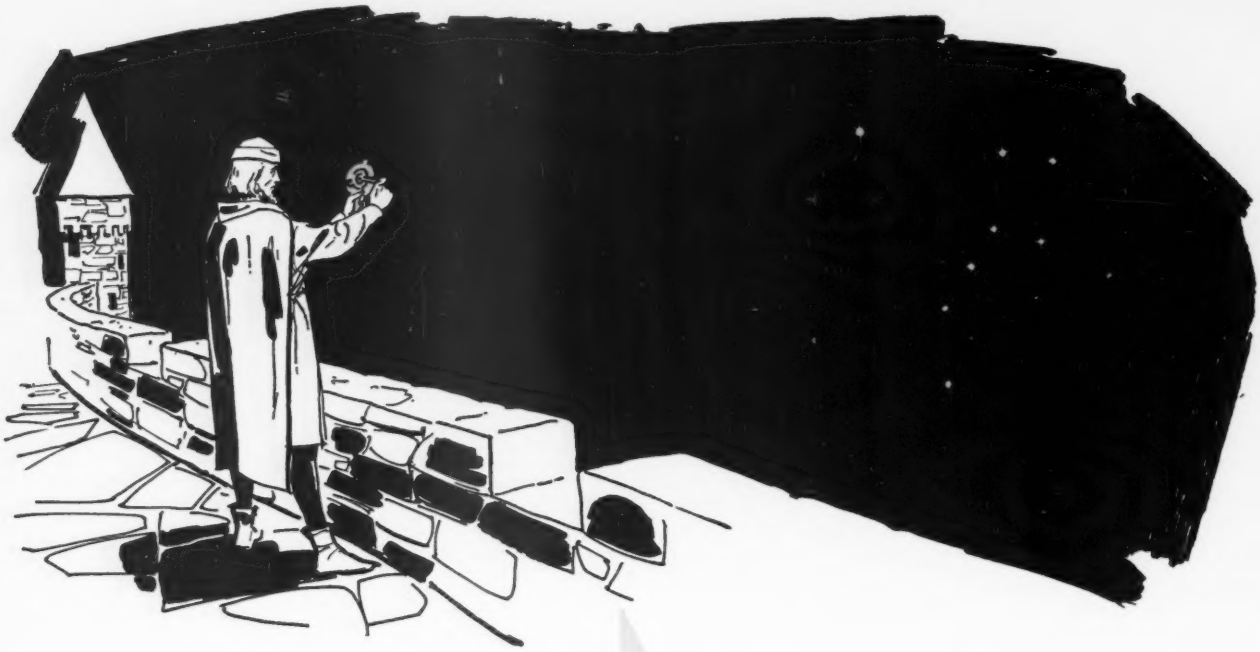
8-9

With the 105 you have the first and only truly modern crawler type unit for heavy work. It's fast. It needs only a minimum of attention. It requires the least in physical operating effort of any machine of its type. It will do many things that no other machine will do; and if mechanical attention is ever necessary, its various units are designed for easy accessibility so that the work to be done can be finished in only a fraction of the time required for a similar repair on any other prime mover.

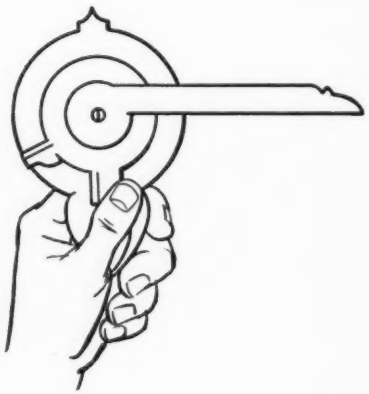
Let us tell you about this machine: where the driver sits up front and can see what he's doing, where the loading equipment is fastened directly to the heavy main frame permitting free track oscillation at all times, that allows for speed changing under full power and load without sacrificing any advantage, that gives you a drawbar pull in the big class with a price in the small class, and many more exclusive advantages. Just write: The Eimco Corporation, P. O. Box 300, Salt Lake City 10, Utah.



Rocker-arm loading action provides fast, efficient loading. Bucket shown in the digging, carry and discharge positions pictured above.



The first Watch with Illuminated Dial



The science of reckoning the hour was making great progress about the time that Columbus discovered America. For now, it was possible to tell the time at night—approximately, that is—and only on clear nights, and provided that you lived in the Northern Hemisphere. All you had to do was hold up the Nocturnal at arms length, sight the Pole Star through the center hole and line up the two pointer stars of the Big Dipper with the bottom of the arm on the Nocturnal. Then, if the moon were bright enough or you happened to have brought along a lighted lanthorn, you could look at the scale and read the time. This was wonderful but unimportant, because the pattern of man's days was still dictated by the number of daylight hours and would so continue for centuries. Today, at the drilling rig, daylight or dark make little difference. What counts is the drill bit. If you depend upon Truco Diamond Bits you get irresistible cutting power in any formation; swift, accurate, thrifty penetration that reduces rig time and pays off handsomely in cash savings. May we send you our Diamond Bit Catalog?

WHEEL TRUEING TOOL COMPANY
3200 W. Davison Avenue, Detroit 6, Michigan

WHEEL TRUEING TOOL CO. OF CANADA, LTD.
575 Langlois Avenue, Windsor, Ont., Canada

NO MORE TIME-OUTS TO CHANGE DRILL STEELS WHEN CHANGING BIT TYPES

Dozens of different TIMKEN® multi-use and carbide insert bits to fit the same steel!

WITH Timken® interchangeable rock bits, you can quickly change to the most economical bit as the ground changes—without changing steels! That's because dozens of Timken multi-use and carbide insert bits fit the same drill steel.

No time wasted going after a different set of drill steels every time a different type bit is needed. It takes the driller only about a minute to unscrew one type of Timken bit and screw the other type on the same drill steel.

You get added drilling economy when you use Timken interchangeable rock bits because they allow you to reduce your drill steel inventory. One set of steels in each thread series is all you need.

Both Timken multi-use and carbide insert bits give you two important advantages:

1) special shoulder union that keeps drilling impact from damaging threads,
2) made from Timken electric furnace fine alloy steel.

We'll gladly send a Timken rock bit engineer to your mine to arrange for a test. His on-the-spot analysis of your drilling problems can cut your drilling costs. There's no obligation. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, O. Cable address: "TIMROSCO".

WHERE YOU CUT COSTS WITH TIMKEN MULTI-USE BITS

Most economical for ordinary ground. With correct and controlled reconditioning, they give lowest cost per foot of hole when full increments of steel can be drilled.

WHERE YOU CUT COSTS WITH TIMKEN CARBIDE INSERT BITS

Give highest speed through hard, abrasive ground. Also most economical for constant-gage holes, small diameter holes, very deep holes.

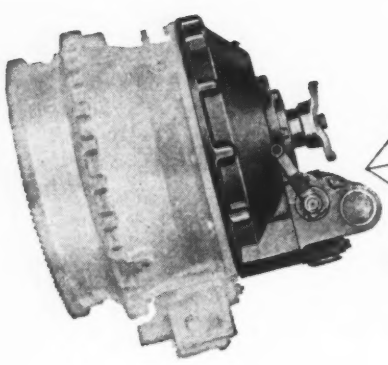
. . . your best bet for the best bit . . . for every job

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

Faster, safer downhill hauling with

New Allison Torqmatic Brake



Speeds job-cycle time—
cuts maintenance costs—no wearing parts
cuts service brake lining wear

ALLISON'S *new* TORQMATIC BRAKE brings faster, safer downhill hauling to heavy-duty trucks. On-the-job tests prove that in many cases drivers can more than *double* present downhill speeds with complete safety. This new dynamic brake speeds job-cycle time for more trips per shift—more pay loads per day.

Proved in Field Tests

This revolutionary new TORQMATIC BRAKE increased round trips 50% per day on year-long tests. Trucks safely came down a 10% grade with a 34-ton load at 12 miles per hour compared to 6 m.p.h. for trucks with friction brakes only. With the TORQMATIC BRAKE, the regular service brake linings lasted from 6 to 8 months —without it they required monthly replacement.

Increased Safety — Better Control

There are no active braking parts to burn up or wear out in the TORQMATIC BRAKE. Drivers have complete control at all times—can brake continuously even going down the steepest grades with the heaviest loads. Trucks never "run away" from the driver. The truck's own rolling force produces the braking power needed, to the limit of the driveline components' strength.

Works on Oil

Oil does all the braking work—absorbs all the braking force. The new TORQMATIC BRAKE takes over from friction brakes on downhill hauls, saves regular service brakes for complete stops or "snubbing" on curves. It's

GM GENERAL MOTORS

Allison

ALLISON'S NEW TORQMATIC BRAKE, attached directly to the TORQMATIC Converter, has three major parts — a turning rotor (or "paddle wheel") attached to the torque converter; non-moving or fixed stator vanes cast into the brake housing; and a control valve.

Here's How it Works: To brake a truck going downhill, the driver pulls the handy control lever to let oil into the brake. The truck's wheels turn the rotor or "paddle wheel" through the truck's transmission. The rotor throws the oil against the stator vanes which resist the oil flow. This makes it harder for the rotor to turn and correspondingly makes it harder for the truck's wheels to turn. The driver gets more braking by letting more oil into the brake. He reduces braking by reducing the amount of oil in the brake. The new brake provides up to 400 h.p. of continuous braking effort.

the *first* downhill braking unit designed and installed as an integral part of the truck's driveline. It bolts directly on the TORQMATIC Converter housing—adds only 4 inches to the converter's length. The brake and converter use the same oil. There are no freezing problems in winter. The TORQMATIC BRAKE can be specified in new trucks equipped with Allison TORQMATIC DRIVES.

If you're hauling on hilly, mountainous downhill runs, you can cut costs and increase production with Allison's new TORQMATIC BRAKE. For full details, contact your truck manufacturer or write for Bulletin SA 1026 to:

ALLISON DIVISION OF GENERAL MOTORS
Box 894M, Indianapolis 6, Indiana

TORQMATIC BRAKE

NEWEST MEMBER OF THE TORQMATIC DRIVELINE

Above: Agidisc on metallurgical concentrate in New England.

Eimco Agidisc Increases Metallurgical Filtration Efficiency

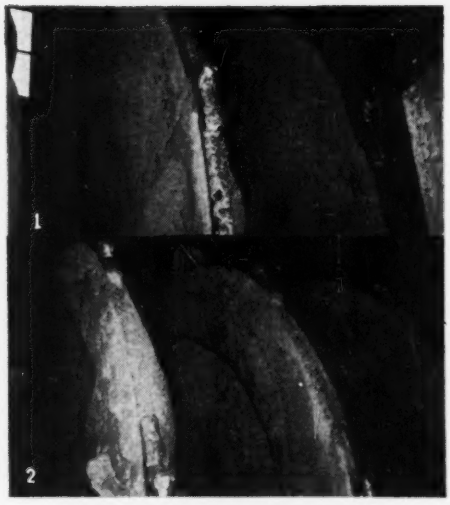
Eimco Agidisc Filters are increasing the production per square foot of filter area in metallurigcal plants.

The Agidisc keeps a fast settling slurry in solution so gently that no eddies are created to disturb the cake formation on the disc. The result of this gentle agitation is a thick even cake over the entire surface of the sector with a resultant uniform drying of the cake, free discharge from the cloth and longer bag life.

Agidisc filters will enable you to realize greater production per square foot of filter area over standard disc design if your slurry contains fast settling particles that settle in the tank. The test of this will be in observation of the operation of your filter. If you see a classification ring as shown in Fig. 2 at right, you are paying the penalty of poor production, high moisture in cake and short bag life.

Eimco has more experience in the design and construction of disc type filters than any other manufacturer. Let us help you with your metallurgical filtration problem.

1. An agidisc filter working on the same feed copper concentrate feed line at the same time as the standard disc. (2) Note classification ring on standard disc. Agidisc delivers 20% more cake with 2% less moisture.



Below: Coal fines filtered on Eimco fitler—note smooth even cake over sectors.

EIMCO

THE EIMCO CORPORATION

Salt Lake City, Utah, U.S.A.

Export Office: Eimco Bldg., 52 South St., New York City

B-4

You Can't Beat An Eimco

Cyanamid REAGENT NEWS

AERO* PROMOTER 404

cuts costs, improves selectivity and recovery

A powerful, water-soluble flotation promoter AERO* Promoter 404 is finding increasing use as a supplementary promoter and as a replacement for conventional promoters. Its use at many flotation operations has sharpened selectivity, increased recovery and reduced reagent costs. Current applications include flotation of auriferous pyrite and pyrrhotite, tarnished and oxide lead, lead-zinc, copper-zinc, copper-lead, free gold, copper-cobalt, cobalt and other complex precious and base-metal ores.

TYPICAL RESULTS ON COPPER-COBALT ORE

PROBLEM: Improve grade and recovery of copper-cobalt bulk concentrate.

SOLUTION: Use AERO* Promoter 404 in conjunction with former promoter.

RESULTS: Copper and cobalt grade improved; cobalt recovery increased; frother consumption cut from 0.06 to 0.03 lb. per ton.

Lb./Ton Reagents		% COBALT		% COPPER	
		Grade	Distribution	Grade	Distribution
0.45 Prom. A 0.06 Frother	Feed	0.65	100	0.90	100
	Cleaner Conc.	8.70	81.3	14.14	96.2
	Cleaner Tails	0.64	5.6	0.29	1.8
	Rougher Tails	0.097	13.1	0.02	2.0
0.15 404 0.30 Prom. A 0.03 Frother	Feed	0.65	100	0.86	100
	Cleaner Conc.	10.40	83.2	15.91	96.2
	Cleaner Tails	0.91	5.3	0.39	1.7
	Rougher Tails	0.082	11.5	0.02	2.1

Cyanamid Field Engineers will be glad to discuss AERO* Promoter 404 usage with you, can supply samples for mill-lab tests, and will assist you with mill testing. Their primary job is to give you unbiased counsel and practical help in working out the best reagent combination for your ore. Your inquiry to our nearest Mineral Dressing office is invited.

*AERO is a trade-mark of American Cyanamid Company applied to flotation reagents and chemicals used in ore beneficiation plants or processes.

AMERICAN Cyanamid COMPANY

MINERAL DRESSING DEPARTMENT

30 ROCKEFELLER PLAZA, NEW YORK 20, N.Y.
Cable Address — Limenitro, New York

NORTH AMERICAN CYANAMID LIMITED
Royal Bank Bldg., Toronto 1, Ontario, Canada
CYANAMID DE MEXICO, S. A.,
Apartado No. 26012, Mexico 12, D. F., Mexico

CYANAMID PRODUCTS, LTD., Bush House,
Aldwych, London W. C. 2, England
SOUTH AFRICAN CYANAMID (PTY.) LTD.,
P. O. Box 7552, Johannesburg, Union of South Africa

E. P. CADWELL, Casilla 12983,
Correo 11, Santiago, Chile
G. B. O'MALLEY, MALCOLM GLEN,
377 Little Collins St., Melbourne C. 1, Australia

"SHUTDOWN" LOSS on foreign soil

prevented by PLANNED insurance protection

It's startling when word arrives "Plant gutted by fire—will be shut down . . ." Serious? Not to the financial soundness of your business if you have planned insurance protection in member companies of American Foreign Insurance Association.

Whatever you manufacture on foreign soil—electrical products in Brazil or tires in Australia—AFIA, through its member companies, offers you planned insurance protection that not only covers your investment in property but pays your continuing expenses during the costly non-productive time consumed in getting back into operation.

AFIA knows local conditions, laws and insurance requirements. It continually gathers the pertinent information so important to your business security from its more than 500 offices and agencies throughout the world.

Decades of experience in protecting the ventures of American business on foreign soil stand behind your protection when your insurance is written in member companies of AFIA.

Ask your agent or broker to secure full information from AFIA for sound insurance protection on your foreign projects.

AMERICAN FOREIGN INSURANCE ASSOCIATION

161 WILLIAM STREET • NEW YORK 38, NEW YORK

CHICAGO OFFICE . . . INSURANCE EXCHANGE BUILDING, 175 WEST JACKSON BLVD., CHICAGO 4, ILLINOIS
DALLAS OFFICE . . . . . MERCANTILE BANK BUILDING, 106 SO. ERVAY STREET, DALLAS 1, TEXAS
LOS ANGELES OFFICE . . . PACIFIC MUTUAL BUILDING, 523 W. 6th STREET, LOS ANGELES 14, CALIFORNIA
SAN FRANCISCO OFFICE . . . . . 98 POST STREET, SAN FRANCISCO 4, CALIFORNIA
WASHINGTON OFFICE . . . . . WOODWARD BUILDING, 733 15th STREET, N. W., WASHINGTON 5, D.C.

TWENTY-FOUR AMERICAN CAPITAL STOCK FIRE, MARINE AND CASUALTY INSURANCE COMPANIES PROVIDING INSURANCE PROTECTION IN FOREIGN LANDS

How New Mexico copper mine speeds tractor work

One Tournatractor clears rock from highway.

The other cleans pit floor around shovel.

WITH mostly rock to handle on a 6-day week, year-round basis, a large open-pit copper mine in New Mexico uses 2 Tournatractors as utility tools.

These rubber-tired tractors clean up around large stripping shovels. They also keep haul roads and highways clear of rock, traveling over pavement without damage. When mixed dirt and rock are encountered, one unit pulls a 20-yard scraper; the other, a Rooter. In spare time, Tournatractors do a wide variety of odd jobs, including stockpiling, unloading supplies, pushing railroad cars, etc.

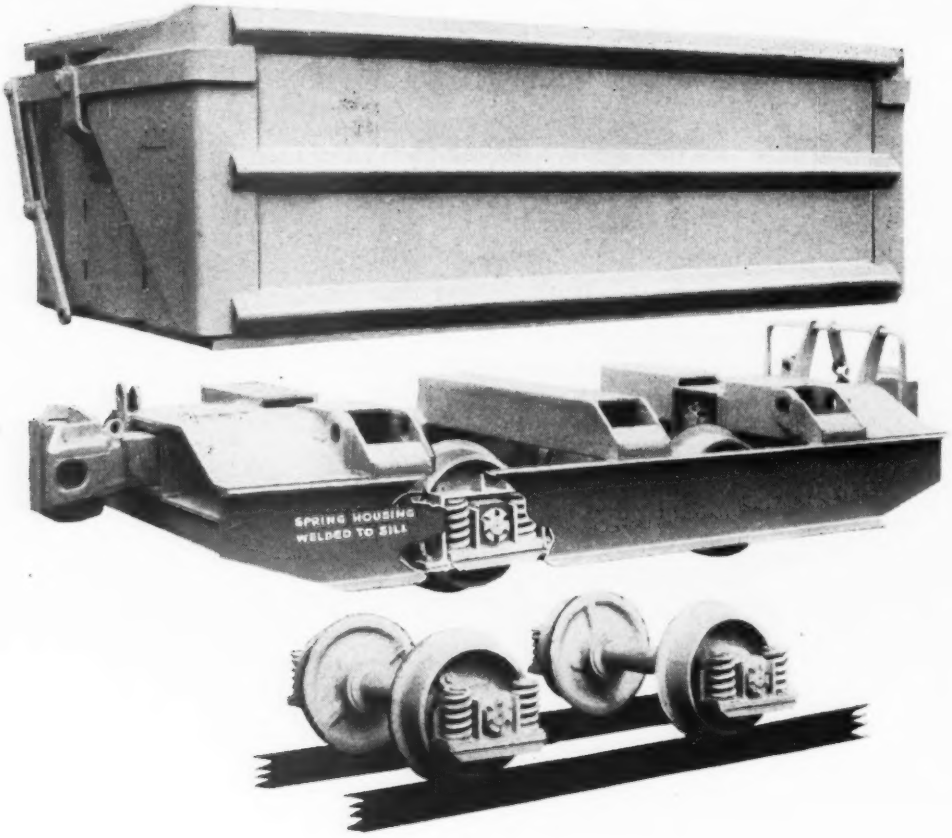
Their chief advantage for this scattered work is their speed. They can go anywhere — across the pit floor or over pavement — at speeds up to 19 mph. With instant-shift transmission and 8 mph reverse, they work 2 to 3 times faster than crawlers on most pushing and pulling jobs.

See for yourself

We will be glad to demonstrate a Tournapull or Tournatractor in your pit. They're better tools than ever since Westinghouse Air Brake's quality manufacturing tradition has been added to LeTourneau's earthmoving leadership.

Tournatractor — Trademark
Tournapull, Rooter — Trademark Reg. U. S. Pat. Off. T-472-M-b

LeTourneau-Westinghouse Company
PEORIA, ILLINOIS
A Subsidiary of Westinghouse Air Brake Company



SANFORD-DAY'S NEW

Here's the story on the advantages of an important

You will be interested in this complete information on the more important advantages of the new Granby Car recently announced by Sanford-Day—a car so designed and constructed to give many years of trouble-free service under extreme shock loading conditions.

OUTSIDE FRAME UNDERCARRIAGE:

1. Rigid undercarriage and full width support of body as a result of frame being tied together with full width transverse, box type members.
2. Greater capacity for any specified dimensions because body hinge points are located outside of wheels, allowing lowest possible bottom.
3. Better trackability on narrow gauges because the low bottom and wide frame give a low center of gravity.
4. Extra rugged hold-down, when needed, utilizing the outside frame.

OUTSIDE SPRING TRUCK BOXINGS:

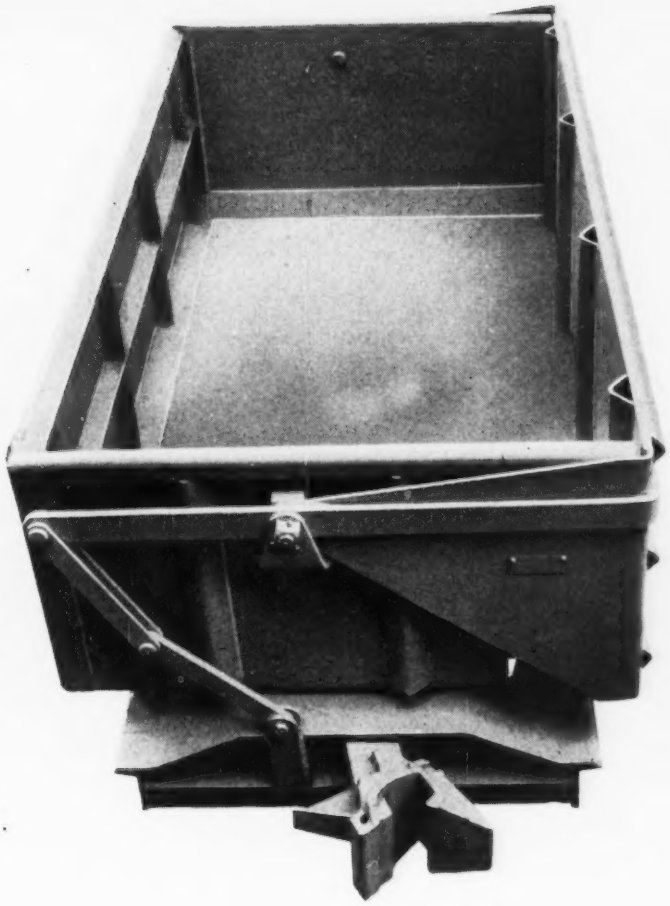
1. Easy access to all parts of truck and boxing for maintenance. By removal of eight small bolts the entire axle, wheels, boxings and spring assembly may be dropped out of frame.
2. Maximum shock absorption for any shock or load condition. All four wheels are in constant contact with rails because of two large outer coil springs and two inter coil springs at each wheel.
3. No pinching of bearings caused by side thrusts loosening shrunk on collar. Any side thrust is transmitted from the frame through the wheel assembly and axle to opposite dust collar, which is abutted against a shoulder on the axle.

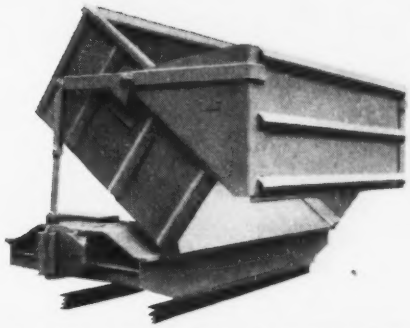
AUTOMATIC COUPLING MOUNTING:

1. No weak spots because coupler housing is so ruggedly fitted into the frame members that all shock is transmitted directly to the frame.
2. Easy removal of the couplers for repairs or inspection because of the box type coupler housing design.

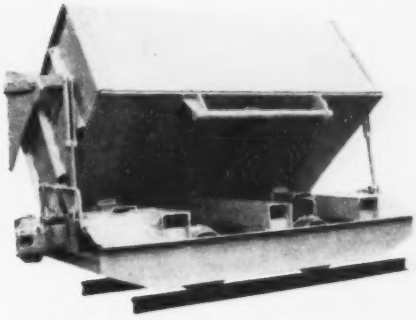
MAXIMUM-STRENGTH BODY:

1. Heavy ¾" bottom plate, instead of the light conventional plates used in most designs, gives longer life and lower maintenance against abrasive shock loading.
2. Car does not require exact spotting for lifting if dumped by air cylinder because ¾" bottom plate affords





Gate side of the S-D Granby Car is shown above with body in dumping position and gate open. The rear view of car when in dumping position is shown below. (Note this car is dumped by air cylinder, but wheel dumping may be used.)



Note in photo at left the inside construction of this new car, featuring valley angles, inside vertical stiffeners on gate side and inside vertical and longitudinal braces on solid side. This particular car was built for a 24" track gauge. The level full capacity is 80 cubic feet. Length inside car body is approximately 9 feet. Width inside is approximately 5½ feet. The size and capacity of this car can, of course, be varied to suit your conditions.

GRANBY CAR . . .

new car for the metal mining industry

rigidity to body lifting means. (Dumping wheel may be added if desired).

3. Braces run vertically and longitudinally on inside of solid side of car for maximum strength and maximum capacity.

4. Inside stiffeners run vertically on inside of gate side of car for clean shedding and outside longitudinal stiffeners insure maximum strength.

5. Valley angles on inside of car, at ends and solid side, also provide better shedding and added body strength.

6. Vertical gussets on outside of ends of car body provide additional strength.

7. Sealing strip is welded to car bottom on gate side.

8. Heat treated pins are used in gate mechanism.

THE GENERAL S-D GRANBY DESIGN:

1. All welded design in which each member is made to serve one or more purposes.

2. Material is utilized in the most economical manner, giving ruggedness with simplicity.

3. All joints and connections have been designed and welded in accordance with the standards set by the American Welding Society Codes. In addition, joints or splices are designed to equal parent metal strength with an ample safety margin. The welding technique employed utilizes the most modern equipment, material and technique available in the world today.

We can truthfully say that no mechanical structure is put together with more skill, better equipment or more modern methods than this new Sanford-Day Granby Car. It is the answer to your demands for longer car life and the lowest possible repair and maintenance costs. We would like to send you complete specifications. Just drop us a line. Regardless of the type car you need, we build it . . . and you will discover that an investment in Sanford-Day built cars will be money well spent.

SANFORD-DAY Iron Works, Knoxville, Tennessee

He Knows!

EXPERIENCE is the truest guide to production efficiency and economy... and experience throughout the mining industry proves that Roebling wire rope is your one top choice for avoiding delays, cutting down replacements and saving wire rope dollars.

All over the country, large numbers of experienced wire rope users definitely prefer Roebling wire rope. Call your nearest Roebling office or distributor for a Roebling recommendation.

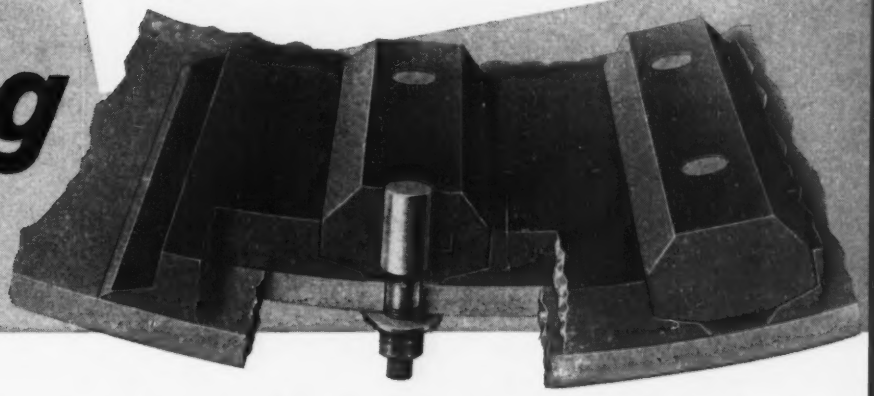
ROEBLING CF&I

A subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.

Cut grinding costs

- U·S·S Lorain Rolled Plate Linings are in easy-to-handle sections, accurate sizes to permit quicker installation.
- Lift bars are designed for correct cascade action . . . height of lift varies according to conditions.
- Plates can be heat-treated to compensate for wear.
- Correct sizes make tighter joints—eliminate shell wash.
- Bolt supports located near the bottom of the bar . . . last for life of the lining.



with U·S·S Lorain Rolled Plate Linings

You can do more and better grinding, for less money, with U·S·S Lorain Rolled Plate Linings. The output of your mill increases when the usable diameter increases, and this is just what happens when rugged Lorain *rolled steel* plates are used instead of ordinary castings. Lorain Liners can be much thinner due to their superior strength. Their lighter weight simplifies handling.

You save money with U·S·S Lorain Rolled Plate Linings because they are readily installed and require less maintenance. The plates are accurately made and are in easy-to-handle sections for ready use. Severe localized wear at feed or discharge end of the mill can be balanced by heat-treating.

Lorain Liners are so durable that they remain serviceable until they're almost paper thin. You benefit from the use of the entire plate . . . there is less waste, longer wear. Mill downtime will be reduced and so will your upkeep costs.

The accurate size of U·S·S Lorain Rolled Plate Linings assures tight fit between the ends of the plates and between plates and lift bars, eliminating shell wash.

U·S·S Lorain Rolled Plate Linings are available—in the diameter, length and thickness best suited to your operating conditions—through leading mill manufacturers whose names will be furnished upon request.

U·S·S GRINDING BALLS are carefully made of special composition steel to take long, rough wear evenly. Samples from each production lot are thoroughly tested to make sure of surface hardness and maximum hardness penetration. They come in eleven sizes from ¾″ to 5″. For further information just return the coupon below.

United States Steel Corporation
Room 4242, 525 William Penn Place
Pittsburgh 30, Pa.

Without obligation on my part, please send me your FREE booklet on U·S·S Grinding Balls.

Name .....

Company .....

Address .....

City ..... State .....

UNITED STATES STEEL CORPORATION, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S LORAIN ROLLED PLATE LININGS AND U·S·S GRINDING BALLS

USS

4-283

UNITED STATES STEEL

Top Management's Out in the Bush Now

You're apt to find mining company management out in the bush today, looking over the shoulder of their air survey crews. Men of decision are moving into the area of decision.

No longer is mining exploration a slowly evolving process, with data collected bit by bit. Mapping camera and airborne magnetometer cover an area in one big gulp. Staking parties often move into a promising area within 24 hours after survey flights. Precise, significant magnetic data, collected swiftly by the air method, can be evaluated at the end of each day's flight. The chief geologist can direct the survey's course, and act quickly to stake claims and plan broadly for the new mining development.

This new intensity of activity makes it worthwhile for the chief geologists, engineers and other management men to become part of the exploration team.

The other part of the team is the AERO staff of specialists: mapping pilots and photographers, electronic engineers and map makers. It is their skill and experience over all types of terrain that keeps the survey moving so fast. They work responsibly and well in the close collaboration that's so important in successful air exploration.

AERO clients have uncovered major finds of iron, asbestos, chrome and titanium—often in blind areas at depths of 1500 feet or more. For able teamwork with your exploration staff, call on AERO's engineers, who have carried out more aerial exploration than anyone else. AERO crews have flown hundreds of thousands of miles of magnetic profiles all over the world.

AERO SERVICE CORPORATION
PHILADELPHIA 20, PA.

Oldest Flying Corporation in the World

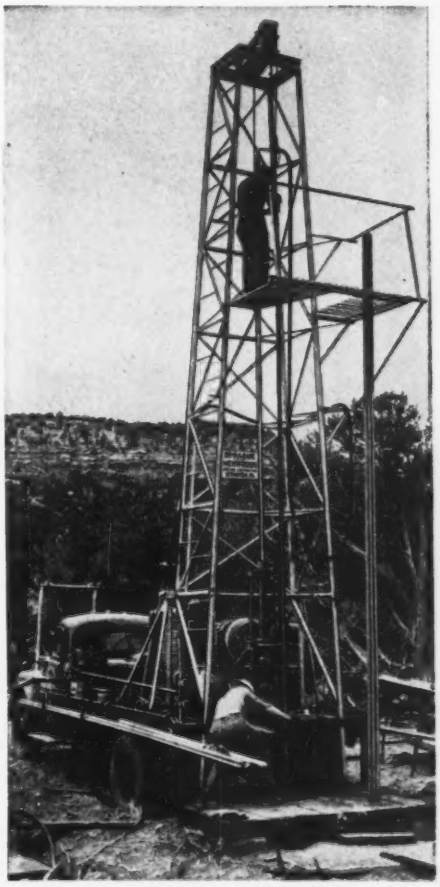
CANADIAN AERO SERVICE, Ltd., Ottawa, *is our affiliate*

CONTRACT DIAMOND DRILLING

Anywhere *Any Time*

For more than sixty years Sprague & Henwood, Inc. has been a leader in the field of Contract Diamond Drilling. During this long period of time our crews have completed thousands of contracts successfully in every corner of the globe—under every conceivable operating condition. Today we have a large force of expert operators and an ample supply of modern equipment, so that we can undertake almost any job—anywhere—on very short notice.

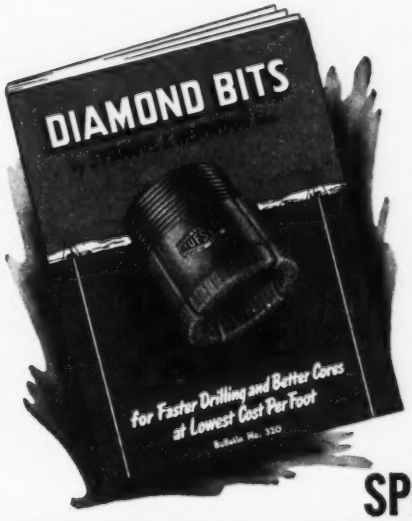
Besides exploratory core drilling, from the surface or underground, our service includes blast-hole drilling, directional drilling, foundation test drilling, grout-hole drilling and pressure grouting. Estimates, and constructive suggestions when possible, submitted promptly on request.



A Sprague & Henwood Drilling Rig in the Colorado Uranium Field.

High-Speed Core Drilling Machines
and Complete Accessory Equipment

The same high-speed core drilling machines and improved accessory equipment that we manufacture, in our own extensive shops, for our own requirements, is equally available to other operators and can be relied upon for best-possible all-round results at lowest ultimate expense. Model 40-C is our latest core drilling machine and is recommended for holes up to 1000 ft. in depth. Other modern machines provide for deeper core drilling and for either blast-hole drilling or core drilling underground. Write for illustrated bulletins.



"ORIENTED" DIAMOND BITS
Cut Faster—Last Longer—Cost No More

Always a leader in its field, Sprague & Henwood, Inc. pioneered the development of oriented diamond bits, in which each individual diamond is set with its hardest edge or "vector" toward the work and has proved by extensive comparative tests that they last much longer and cut much faster than ordinary bits in which the diamonds are set at random. Only selected diamonds of suitable crystaline structure can be used and only specially trained and equipped setters can be relied upon to orient the diamonds correctly in the mold, but we are now fully organized to produce Oriented Diamond Bits efficiently and are furnishing them at no additional charge.

In terms of Footage Cost, these are the Most Economical Diamond Bits ever produced and we invite inquiries on that basis. Bulletin 320 illustrates and describes all types and gives complete working data.

SPRAGUE & HENWOOD, Inc., Scranton 2, Pa.

Branch Offices: New York • Philadelphia • Pittsburgh • Grand Junction, Col. • Buchans, Newfoundland

IMPOSSIBLE WITHOUT EXPLOSIVES

120 million tons of iron ore, it is estimated, were mined in open pits and underground operations last year. This photograph shows some of the highly mechanized operations which make such huge production possible.

But before the ore can be dug, millions of pounds of explosives are used to break it loose from working faces, to assure easy shovel digging and rapid transportation of the ore to the crushing and washing plants.

The manufacture of explosives and the knowledge of their efficient and economical use have been Hercules business for 40 years. During this time we have studied the varying conditions under which explosives are used and have pioneered in developing the right types of explosives for industrial needs. Hercules explosives and services assure economical and efficient blasting not only in metal mining, but in coal mining, quarrying, construction—in fact, wherever explosives are used.

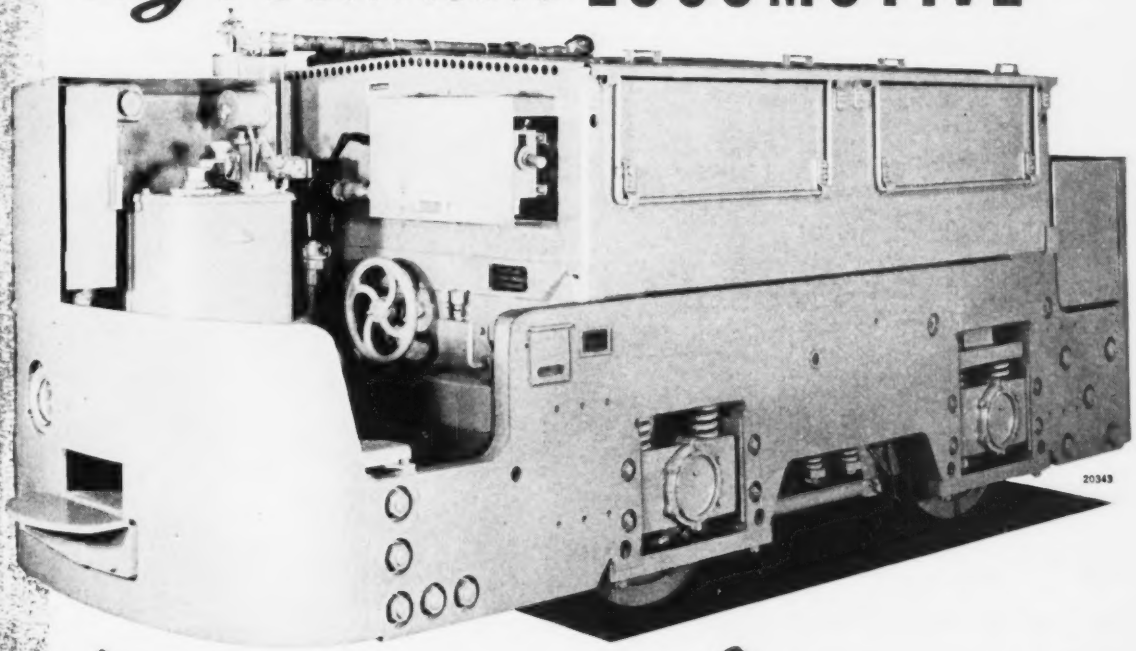
HERCULES POWDER COMPANY
INCORPORATED

Explosives Department, 933 King St., Wilmington 99, Del.

Birmingham, Ala.; Chicago, Ill.; Duluth, Minn.; Hazleton, Pa.; Joplin, Mo.; Los Angeles, Cal.; New York, N. Y.; Pittsburgh, Pa.; Salt Lake City, Utah; San Francisco, Cal.

XR54-1

A TWO-WAY PAYOFF
with this
Goodman LOCOMOTIVE



1 It's a storage battery locomotive for gathering work at chutes and haulage through rotary dump, where it is not practical to string trolley wire or trail cable.

2 It's a trolley locomotive for heavy, main line hauls. Battery is charged automatically when operating on trolley.

Chassis weight is 10 tons; gauge 36 inches; over-all height 65¾ inches; over-all length 15′. Running drawbar pull on trolley is 5000 lbs. at 7½ mph; on battery, 5000 lbs. at 3 mph. There are two 60 hp, 250 volt motors.

PRACTICAL CONSTRUCTION FEATURES:

Camtactor controller
Roller bearing axle journals
Transverse equalizer for best track performance
Hydraulic brakes
Continuous strip resistance

Plus the Goodman wet mine design for full protection of controller, motors, resistance, batteries and brake system from water and muck.

There is a Goodman trolley, storage battery or combination type to fit your job. We shall be pleased to work with you.

Catalog CH-521 describes in detail the Goodman line of metal mine locomotives. Your request will bring you a copy promptly.

Goodman MANUFACTURING COMPANY
HALSTED STREET at 48th • CHICAGO 9, ILLINOIS
BUILDERS OF UNDERGROUND MINE MACHINERY FOR MORE THAN 50 YEARS

. . . AND WHY THERE'S MUCH MORE TOUGHNESS IN ANACONDA'S NEW MINING MACHINE CABLE

Your naked eye can't spot diameter differences in new cables. That's why it's important to check promptly when you *do* see variations in cable after it's been used. It has probably been crushed . . . by runovers or rib-pinching. Compression cuts may let in moisture *to shorten cable life.*

HOW TOUGH SHOULD CABLE BE?

As tough as we can make it—regardless of cost. One break in a cheap cable costs more than you can save by buying on price. The new ANACONDA Cables mean lower costs to you because they can take much more abuse. In fifteen mines recently surveyed, the average life of ANACONDA Cables on shuttle cars jumped 300% over cables used only a few years ago.

WHY THE NEW ANACONDA CABLES LAST LONGER

A stronger jacket, made from a new neoprene compound, resists heat, flame and moisture better. In wet mines, sliver-cuts that may cause shocks are less likely to occur. A new cold-rubber insulation means new toughness. Moisture-wise and puncture-wise both. A new type of stranding improves the flexibility of these cables under stress.

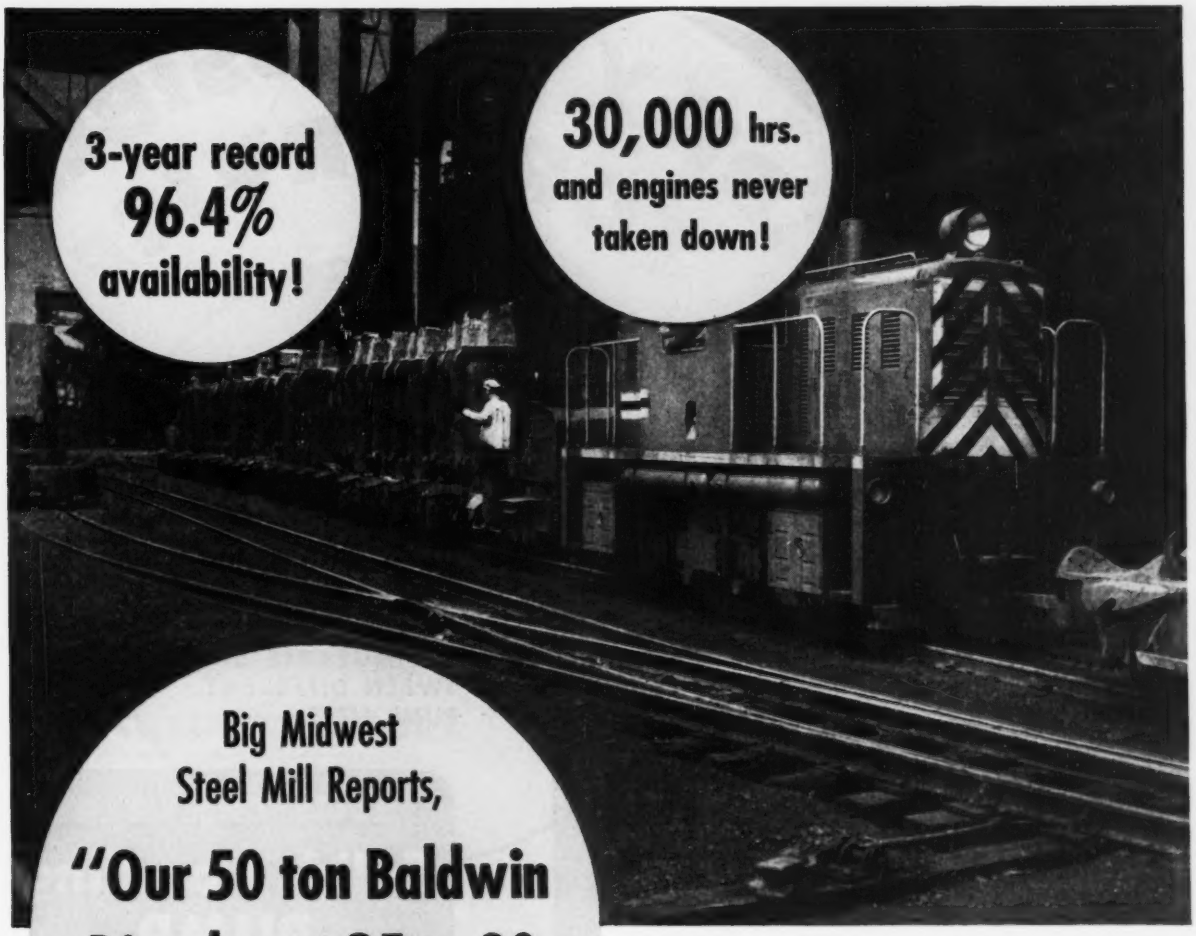
YOU BE THE JUDGE

Examine an ANACONDA Cable. See why these things are so. Call your nearest Anaconda Sales Office or Distributor for a sample. And remember: no ANACONDA Cable has ever failed a U. S. Bureau of Mines flame-test. *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.*

53301

ANACONDA®

TODAY'S HEADQUARTERS FOR MINE CABLE



Big Midwest Steel Mill Reports,

"Our 50 ton Baldwin Diesel gets 25 to 30 heats out on time every day!"

When it costs hundreds of dollars for every delay of a minute in getting a heat out and the ingots to the blooming mills and soaking pits, efficient, dependable locomotives are indispensable to a steel mill. A major steel mill in the midwest reports a remarkable record of money-saving performance by their Baldwin industrial diesel-electric locomotive:

"Our 50-ton Baldwin replaced two steam locomotives on the hot line moving ingots to the blooming mills and soaking pits. We tap 8 to 10 heats a shift, three shifts a day. The heats run as much as 150 tons, making many of the loads for the Baldwin 594 tons which theoretically would require a 32% heavier diesel. But this Baldwin has handled *every* job 24 hours a day for over 3 years in spite of the extreme heat, bad curves and rough track conditions on this run. It is taken off the job each week two hours for inspection and lubrication. No major repairs have been necessary during 30,000 hours of operation."

In mine or mill, you, too, can depend on similar economy and dependability by switching to and with Baldwin Industrial locomotives.

BALDWIN · BLH · LIMA-HAMILTON

BALDWIN - LIMA - HAMILTON

INDUSTRIAL LOCOMOTIVES

READILY ACCESSIBLE FOR SERVICE

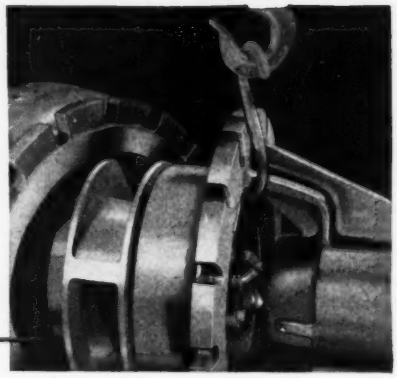
- ALL MAINTENANCE POINTS ARE EASY TO REACH.
- CAN BE TAKEN DOWN AND RETURNED TO SERVICE IN LESS THAN A HALF HOUR.
- MANY PARTS INTERCHANGEABLE BETWEEN DIFFERENT PUMP SIZES.

ALLIS-CHALMERS
Solids Handling PUMP

Here's How Easy Service Is

Disconnect drive, loosen casing bolts and lift bolt assembly from slots. Bolt, nut and washers are still connected for easy reassembly.

Swing out rotating element. Neither suction or discharge piping is disturbed. All wearing parts are fully accessible for inspection or service.

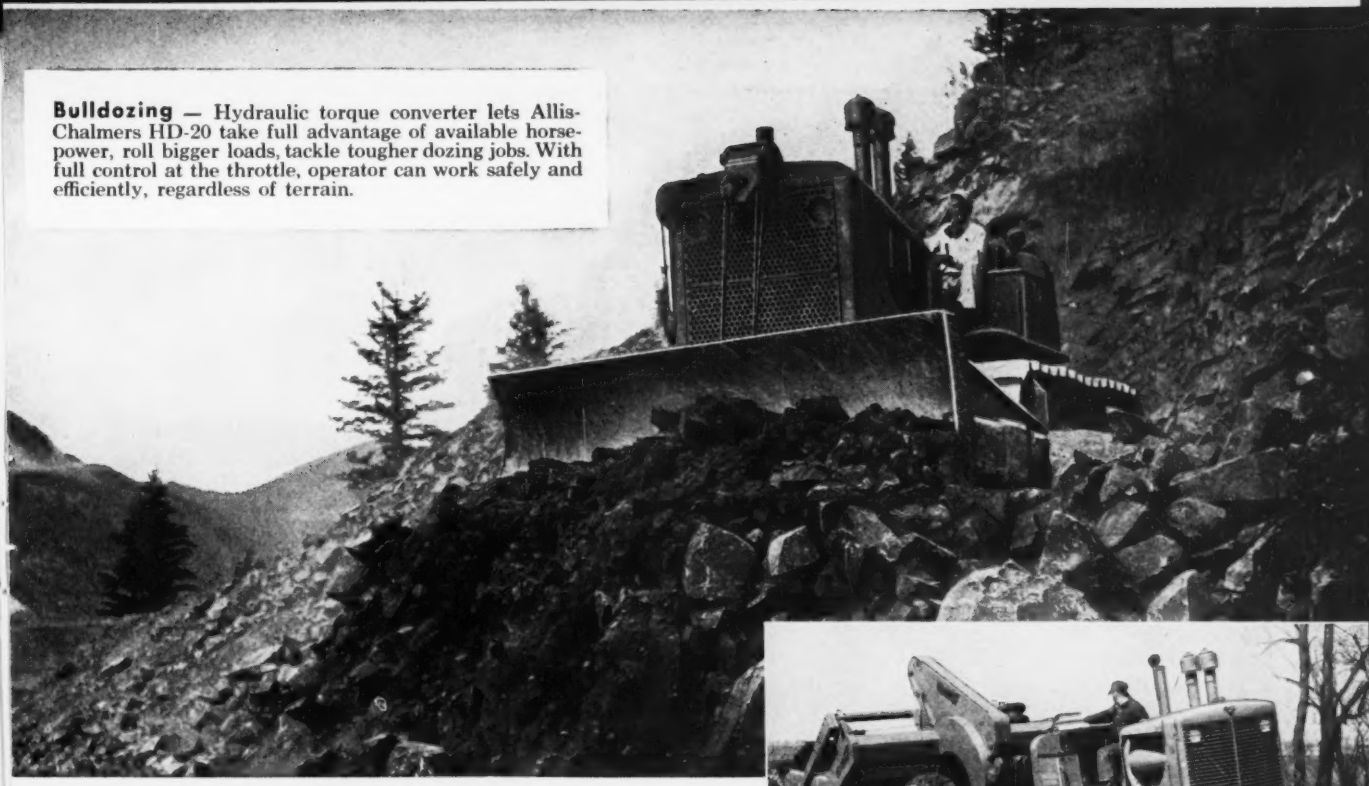


FOR HELP ON YOUR SOLIDS HANDLING PROBLEMS, call your nearest Allis-Chalmers District Office. For more information, write Allis-Chalmers, Milwaukee 1, Wisconsin for Bulletin 52B6381.

ALLIS-CHALMERS

A-C ALLIS CHALMERS

A-4225



Bulldozing — Hydraulic torque converter lets Allis-Chalmers HD-20 take full advantage of available horsepower, roll bigger loads, tackle tougher dozing jobs. With full control at the throttle, operator can work safely and efficiently, regardless of terrain.

AN ALLIS-CHALMERS REPORT

How hydraulic torque converter drive improves big tractor performance—increases job output

With a two-range transmission and hydraulic torque converter, the Allis-Chalmers HD-20 is the only crawler tractor that is capable of exerting maximum drawbar pull *at all times* . . . under all load and terrain conditions . . . without gear-shift guesswork.

Whatever the job, the operator need merely make contact with the load and then open the throttle. As the load requirements change, the hydraulic torque converter *automatically* matches the conditions with exactly the right combination of speed and pull.

This eliminates most shifting . . . leads to far more work done in a continuous work cycle . . . far longer equipment life.

• • •

Hydraulic torque converter drive, exclusive as standard equipment with Allis-Chalmers, is just one of many reasons why the HD-20 assures you higher output with less upkeep. Your nearby Allis-Chalmers dealer invites you to get the full story . . . and to see it in action.

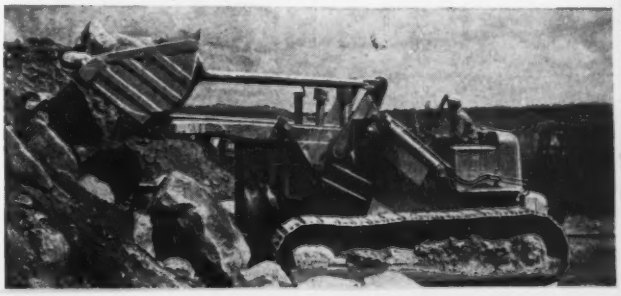
WEIGHT — 41,000 LB. • 175 NET HP. AT FLYWHEEL

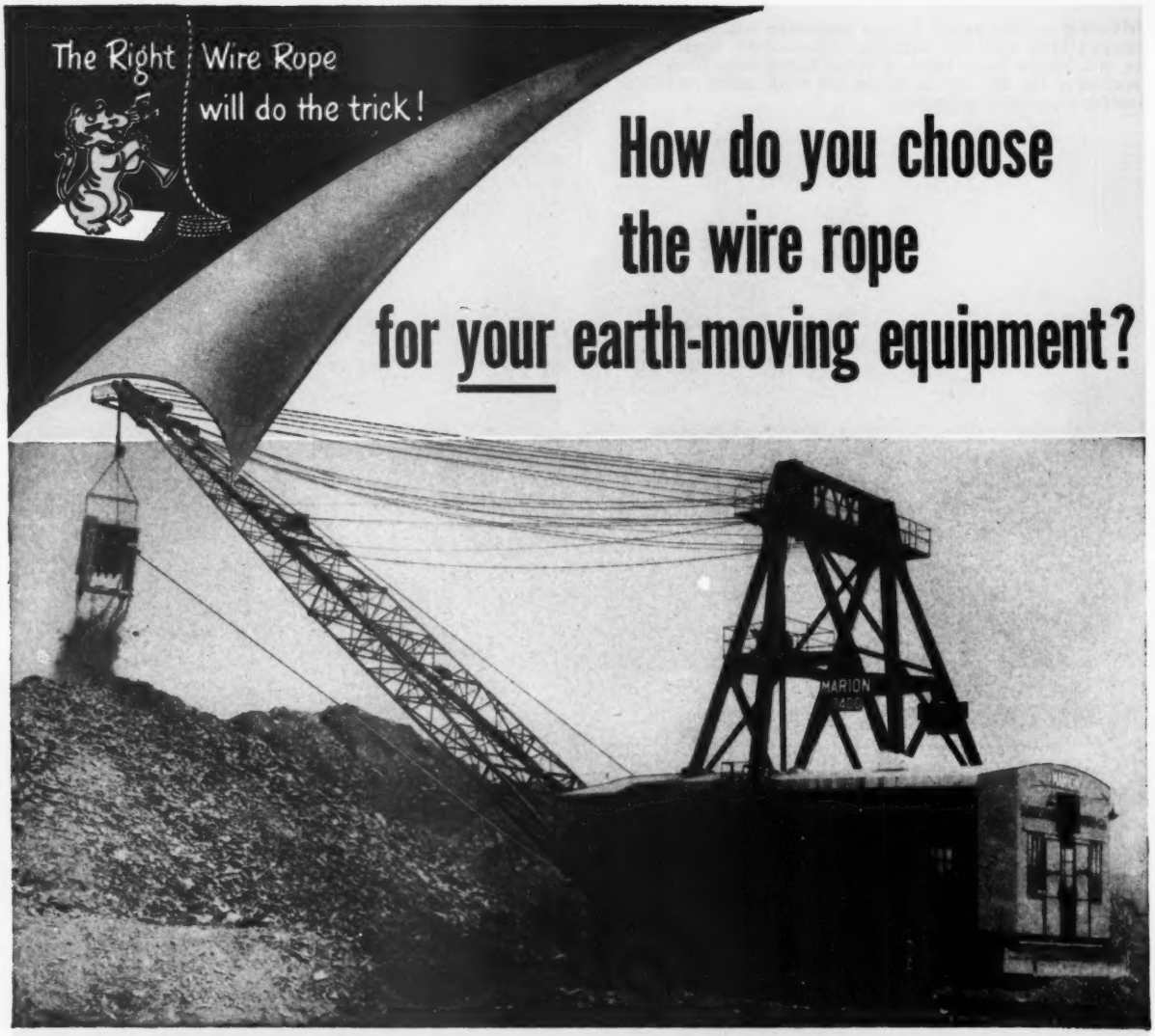
ALLIS-CHALMERS
TRACTOR DIVISION — MILWAUKEE 1, U. S. A.

Pulling — Hydraulic torque converter drive actually multiplies torque up to four and one-half times . . . develops tremendous drawbar pull to start the load smoothly . . . and automatically accelerates to the highest speed that conditions permit, in either high or low range.

Pushing — Operator just makes contact, then opens the throttle and relaxes. The HD-20 automatically matches speed to that of pushed equipment, maintains steady contact while loading, sends load off to the fill at higher speed.

Digging and Loading — With the HD-20G, the operator crowds surely and steadily, using only throttle and bucket levers. With full horsepower always available even at creeping speed, he can work effectively in mud, on hillsides or edges of banks.





How do you choose the wire rope for your earth-moving equipment?

EVERY wire rope on your stripping or excavating machinery needs a particular combination of strength, fatigue resistance, and flexibility. Hoist ropes on big power shovels need high tensile strength to absorb impact stresses and must be extremely tough to withstand constant bending over sheaves. On draglines, drag ropes must possess high strength combined with great abrasion resistance. Boom ropes must have strength plus fatigue resistance.

There's an American Tiger Brand Wire Rope that has been especially designed for every grueling rope job that you will encounter. And it pays to spend a little extra time to analyze your rope requirements carefully and determine exactly which Tiger Brand Rope is the best one to use.

Our experienced Wire Rope Engineers will be glad to help you do this. They know what every Tiger Brand Rope can do and what type of rope every job requires. Their assistance assures you of getting the *right* rope for every job; and that saves you money. Remember, the right rope often lasts up to twice as long as the wrong one. Free engineering service is available through our nearest District Sales Office or by writing to American Steel & Wire, Rockefeller Building, Cleveland 13, Ohio.

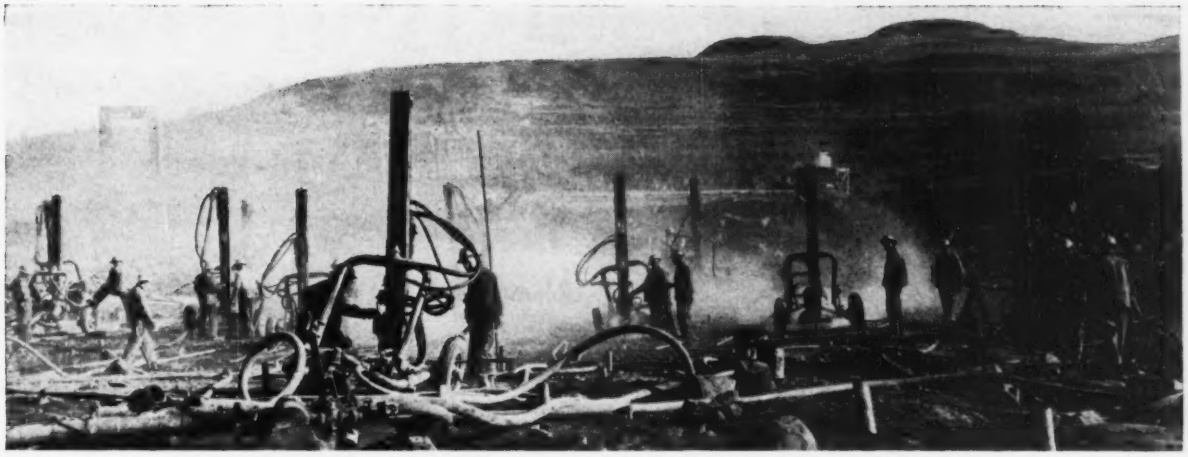
AMERICAN STEEL & WIRE DIVISION
UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S AMERICAN TIGER BRAND WIRE ROPE

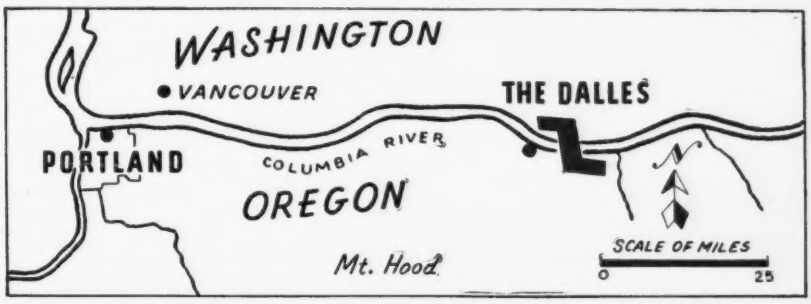
Excellay Preformed

USS

UNITED STATES STEEL



The dust flies as this large battery of wagon drills goes into action, clearing the way for S-shaped, 8500-ft The Dalles Dam, located on Columbia River, east of Portland, Oregon.



This map shows approximate location of 8500-ft The Dalles Dam on Columbia River.

Irving Rauw, owner, Westland Equipment Co., supplier of the Bethlehem hollow drill steel.

Clearing the way for The Dalles Dam on Columbia River

To further the development of the great Northwest, a gigantic new dam, called The Dalles, is taking shape near the city of that name on the Columbia River, east of Portland, Oregon. The new structure, built for navigation and power purposes, is part of the Federal Columbia River Power System of multiple-purpose dams. It is being constructed by the Portland District, Corps of Engineers, U. S. Army.

The Dalles Dam is an S-shaped structure, 115 ft above normal tailwater elevation, and 8500 ft long. Upon completion, it will impound 317,000 acre-feet of water, and the power house will produce 1,746,000 kw of ultimate power.

One of the early contracts for the huge dam was awarded to Atkinson Ostrander Company, San Francisco, Calif. It called for the construction of the concrete spillway dam, including spillway tainter gates, and excavation for the tailrace and approach channel.

One of the initial tasks facing Atkinson Ostrander was the removal of approximately 2,160,000 cu yd of Columbia River basalt, a dense, grayish-black igneous rock. The contractors drilled blast holes ranging from 18 ft to 24 ft deep, using wagon drills equipped with Bethlehem hollow drill steel, and fitted in most cases with carbide-insert bits.

As has been the case in so many of the country's important construction projects, Bethlehem Hollow Drill Steel gave good, dependable service, and was instrumental in keeping this portion of the job on schedule.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

Two Grades of

BETHLEHEM HOLLOW DRILL STEEL

CARBON • ULTRA-ALLOY (chrome moly)

BETHLEHEM STEEL

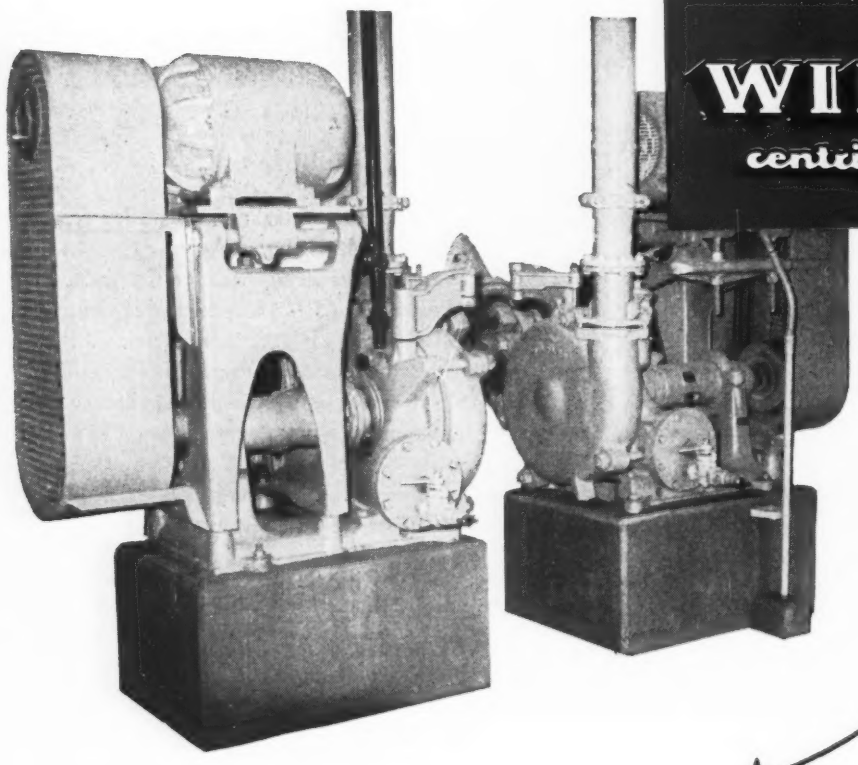
Greater Savings

through

High Efficiency and Economy

Wilfley Model K Sand Pumps meet every cost-saving requirement in handling sands, slurries and slimes. These famous pumps definitely increase production and create measurable savings in operating costs. Individual engineering on every application. Write or wire for complete details.

• Cost-saving efficiency • Stepped-up production • Continuous operation without attention • Minimum replacement of parts • Designed for simple installation • Economical pump size for every application



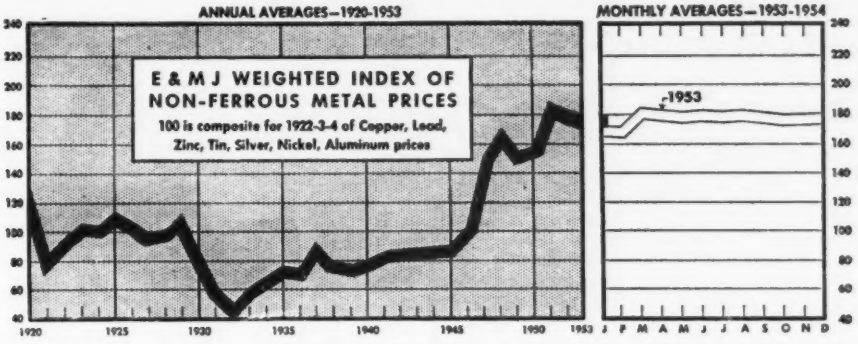
WILFLEY
centrifugal PUMPS

Companion to the famous WILFLEY Acid Pump

A. R. WILFLEY & SONS, Inc. • Denver, Colorado, U.S.A. • New York Office: 1775 Broadway, New York City

E&MJ OUTLOOK

PRICES



MARKETS

Lower lead and zinc prices in January brought the *E&MJ* index of non-ferrous metal prices down slightly to 179.75 for January, against 180.66 in December and 172.82 a year ago.

Positively, say the zinc people, this 9½c price is rock bottom. The lead industry feels about the same. With zinc stocks as high as they are, however, it appears unlikely that much strength can show in zinc at least, for some time. Curtailment of production has probably begun in earnest.

Copper producers, eyeing the zinc market, have already begun to curtail production, for the most part simply abandoning overtime operation. You may see a steady copper market for longer than anyone expected.

•

LABOR

There's no sun in the winter of Mine, Mill's discontent, to paraphrase Shakespeare on a subject he never heard of. The anti-Communist chill grips this union's activities ever more tightly. (See p. 144)

•

AT HOME

Business is good, by any comparison except with the super-boom of 1953, and will stay pretty much that way unless we succeed in talking ourselves out of it. Don't let the calamity-howlers frighten you.

Major mining companies, including even an iron ore company, are buzzing around the Big Indian Wash area in the Colorado Plateau uranium country. Homestake just bought the Little Beaver Co. there. Uranium mining is big business at last.

A new titanium plant may be built for the U.S. by DuPont to produce up to 8,000 tons of metal a year. If the process isn't obsolete by the time design is complete, the plant will go up at a cost of $30-million.

Chemical Construction Co.'s deal with Howe Sound lets Chemico spend up to $1-million in capital investment to bring the Garfield plant up to capacity production of cobalt within two years. If it is, Howe Sound pays the million; if not, Chemico stands the loss. Chemico's taking the risk to prove the process will really work.

•

ABROAD

Settlement of the Chilean copper question hung fire again as January ended, when the Chamber of Deputies went home without approving the agreement achieved between the government and the copper companies. It will all be worked out, but when?

Tin producers are confident the tin control agreement will be ratified before mid-1954, with U.S. approval or without it.

MARKETS—Trends and Prices

Copper Producers Continue to Mark Time Awaiting Settlement of Chilean Deal—Lead and Zinc Decline

AFTER AN EXTREMELY SLOW START, fabricators of nonferrous metals showed a little more buying interest as January progressed. But taking the month as a whole, the volume of new business was below the average of recent months. Consumers continued to reduce their inventories in anticipation of a moderate recession in general business activity. This movement was more pronounced in steel than in other important industries. Sellers of manganese, chrome, tungsten and iron ores reported almost no activity throughout the month and quoted prices in these products, in numerous instances, were little more than nominal.

To maintain a reasonable balance in supply and demand, U.S. producers and fabricators of metals moved toward eliminating all overtime pay and reinstating the normal work week. In the case of copper, major producers announced they are cutting back the work week from seven days to six. Various lead-zinc properties are heading toward a five-day week.

The operating rate of the steel industry averaged less than 75% of capacity during January. Benjamin F. Fairless, chairman of U.S. Steel, pointed out that the slackening in the operating rate of the steel industry may easily be misinterpreted in appraising the economic future. Plants never were intended or designed to run at 100% of theoretical capacity, he said, except during an emergency.

Prices Unsettled

The *E&MJ* index of nonferrous metal prices declined from 180.66 in December to 179.75 in January. Lower averages for lead and zinc accounted for the decline. Domestic copper was about unchanged for the month, notwithstanding a general drop in sales volume. Tin was steady. Aluminum was quotably unchanged. Among the precious metals, platinum encountered a little selling pressure on increased offerings from various European centers. Operators here thought that some of this platinum originated in Russia. Silver of foreign origin continued at 85¼c, N.Y. Business in free exportable silver in London has been moderate on the basis of 73¾d an ounce.

Another month passed without reaching a settlement in Chile's pressing copper problem. A news report from Santiago late in January indicated that a measure has been drafted that authorizes an exchange rate of 110 pesos to the dollar, along with a net profits tax scaled down from 75% when production exceeds 360,000 tons a year. Production of blister and/or refined copper in Chile during the eleven months ended November 1953, totaled 336,299 short tons. Production during 1952 totaled 422,493 tons. Copper authorities claim that output in Rhodesia has attained a higher rate than that of Chile, with the area now second to the U.S. as a source of supply.

In the U.S. market, copper sold during the month at prices ranging from 29½c to 30c a pound, delivered, with consumers interested chiefly in nearby metal because of uncertainty over the price situation. In the foreign division, prices realized varied between a shade below 26½c and a high of 29.775c, f.a.s. N.Y. equivalent. The low prices were paid on April-May copper. Chilean copper sales to U.S. consumers accounted for the high for the month.

An unexpected dip in the London price of lead temporarily scared off buyers here and caused the N.Y. quotation to fall to 13c on Jan. 18. Demand soon improved at the lower level. The decline depressed the f.a.s. Gulf quotation on foreign lead to 10¾c.

Zinc also suffered because of weakness abroad and the price declined to the new low for the movement of 9½c, East St. Louis, on the Prime Western grade. The f.a.s. Gulf price dropped to 8½c. In view of the large stocks now on hand, a reduced smelter output of zinc has not yet made an impression on the market.

Tin prices remained fairly steady and averaged a little higher during January. Producers are fairly optim-

E & M J Index of Non-Ferrous Metal Prices

(100 is composite for 1922-3-4)

Year			1950	1951	1952	1953
1942	86.80	January	135.86	192.48	193.83	172.82
1943	88.74	February	135.65	194.06	195.10	172.29
1944	88.74	March	132.60	190.19	195.10	184.44
1945	90.86	April	134.04	190.18	194.93	182.61
1946	110.06	May	142.02	189.47	186.88	181.58
1947	149.46	June	154.30	187.19	179.18	182.63
1948	168.38	July	156.40	186.46	179.79	182.20
1949	151.97	August	160.67	186.15	178.70	182.70
1950	156.42	September	172.56	186.15	178.59	181.10
1951	190.16	October	179.83	193.21	173.85	180.05
1952	183.33	November	186.00	193.17	172.04	180.45
1953	180.29	December	187.05	193.17	172.00	180.66

Average Prices for January (E&MJ Quotations)

Copper:	
Electrolytic, domestic, refinery	29.671
Electrolytic, export, refinery ..	28.767
Lead:	
Common, New York	13.260
Common, St. Louis	13.060
Silver and Sterling Exchange:	
Silver, New York, per oz.	85.250
Silver, London, pence per oz. ..	73.750
Sterling Exchange, "Checks"	281.163
Zinc:	
Prime Western East St. Louis	9.760
Prime Western, delivered (g)	10.260
Tin:	
New York Straits	84.830
New York, 99% min. .....(e)	83.830
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	$187.360
Antimony (E&MJ) (d)	31.970
Antimony, bulk, Laredo	28.500
Antimony, in cases, Laredo	29.000
Platinum, refined, per oz.	$90.160
Cadmium (a)	200.000
Cadmium (b)	207.500
Cadmium (c)	215.000
Aluminum, 99% plus, ingot	21.500
Magnesium, ingot	27.000
Nickel (f)	60.000

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lbs.

(a) Cadmium average based on the producers' quotations.

(b) Cadmium average based on the average of the producers' and platers' quotation.

(c) Cadmium average based on platers' quotation.

(d) Domestic, 5 tons or more but less than carload lot, packed in cases, f.o.b. New York.

(e) Tin content.

(f) F.o.b. Port Colborne, U.S. duty included.

(g) Delivered where freight exceeds 0.5c.

Markets Continued on Page 148

istic over prospects for the acceptance of the agreement aimed at regulating the market. President Eisenhower, in his budget message to Congress, said stockpile purchases of tin are about to end and doubt exists on the continued operation of the Government's Texas City smelter after the current fiscal year ends.

Though cadmium continued at $2 per pound throughout January, a 30c reduction in the price became effective on Feb. 1.

Importers of manganese ore held out for $1.08 to $1.10 per long ton unit, duty extra, but attracted no business.

"Free" Gold Market

Sales of gold in the "free" market by Russia ceased during January. Trading was active all over the world and showed marked improvement in India, the Far East and at various centers in South America. Prices were irregular, with no pronounced net changes for the month. Pick's World Currency Reports quotes as follows, per fine oz:

	COINS		BARS (12.5 kg.)	
	Dec. 31	Jan. 30	Dec. 31	Jan. 30
NEW YORK, transit	.....	.....	$35.20	$35.20
MANILA	$41.25	$41.00	36.00	35.05
HONG KONG	41.50	41.50	37.30	37.70
BOMBAY	46.75	46.85	44.75	45.90
TANGIER	40.00	40.00	35.20	35.15
BEYROUTH	40.45	41.00	35.35	35.30
PARIS	43.75	42.85	36.00	35.95
BUENOS AIRES	42.00	44.00	36.25	36.25

Note: All prices are computed at the free or black market value of the U. S. dollar in the local markets.

Major Metals
U. S. DAILY AND AVERAGE PRICES

Jan. 1954	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc Delivered (f)	Zinc East St. Louis
1	Holiday	Holiday	Holiday	Holiday	Holiday	Holiday	Holiday
2	No Market	29.075	84.500	13.500	13.300	10.500	10.000
4	29.700	28.675	84.250	13.500	13.300	10.500	10.000
5	29.600	28.625	85.000	13.500	13.300	10.500	10.000
6	29.700	28.650	85.250	13.500	13.300	10.500	10.000
7	29.675	28.725	85.250	13.500	13.300	10.500	10.000
8	29.700	28.725	84.750	13.500	13.300	10.500	10.000
9	No Market	28.675	84.750	13.500	13.300	10.500	10.000
11	29.700	28.850	84.750	13.500	13.300	10.500	10.000
12	29.700	29.125	84.500	13.500	13.300	10.500	10.000
13	29.700	28.900	84.500	13.500	13.300	10.500	10.000
14	29.675	28.825	85.000	13.500	13.300	10.500	10.000
15	29.675	28.775	85.000	13.500	13.300	10.500	10.000
16	No Market	28.675	85.000	13.500	13.300	10.500	10.000
18	29.675	28.775	84.500	13.000	12.800	10.000	9.500
19	29.650	28.475	84.500	13.000	12.800	10.000	9.500
20	29.625	28.800	85.500	13.000	12.800	10.000	9.500
21	29.625	28.600	84.750	13.000	12.800	10.000	9.500
22	29.625	28.975	84.750	13.000	12.800	10.000	9.500
23	No Market	28.675	84.750	13.000	12.800	10.000	9.500
25	29.675	29.025	84.500	13.000	12.800	10.000	9.500
26	29.650	28.750	84.750	13.000	12.800	10.000	9.500
27	29.700	29.000	85.250	13.000	12.800	10.000	9.500
28	29.675	28.575	85.000	13.000	12.800	10.000	9.500
29	29.700	28.550	85.000	13.000	12.800	10.000	9.500
30	No Market	28.675	85.000	13.000	12.800	10.000	9.500
AVERAGES FOR MONTH							
Jan.	29.671	28.767	84.830	13.260	13.060	10.260	9.760
AVERAGES FOR WEEK							
Jan.							
6	29.669	28.820	84.750	13.500	13.300	10.500	10.000
13	29.695	28.833	84.750	13.500	13.300	10.500	10.000
20	29.660	28.721	84.917	13.250	13.050	10.250	9.750
27	29.655	28.838	84.792	13.000	12.800	10.000	9.500
CALENDAR WEEK AVERAGES							
Jan.							
2	29.681	29.120	84.500	13.500	13.300	10.500	10.000
9	29.675	28.679	84.875	13.500	13.300	10.500	10.000
16	29.690	28.858	84.792	13.500	13.300	10.500	10.000
23	29.640	28.717	84.792	13.000	12.800	10.000	9.500
30	29.680	28.763	84.917	13.000	12.800	10.000	9.500

Silver, Gold and Sterling
DAILY AND AVERAGE PRICES

Jan. 1954	Sterling Exchange "Checks"	Silver (c) New York	Silver London	Gold Holding	Gold (d) United States Holding
1	Holiday	Holiday	Holiday	Holiday	Holiday
2	(e)	(e)	(e)	(e)	$35.00
4	281.1250	85.250	73.750d.	248s.	35.00
5	281.1250	85.250	73.750d.	248s.	35.00
6	281.1250	85.250	73.750d.	248s.	35.00
7	281.2500	85.250	73.750d.	248s.	35.00
8	281.1875	85.250	73.750d.	248s.	35.00
9	(e)	(e)	(e)	(e)	35.00
11	281.1875	85.250	73.750d.	248s.	35.00
12	281.1250	85.250	73.750d.	248s.	35.00
13	281.1250	85.250	73.750d.	248s.	35.00
14	281.1875	85.250	73.750d.	248s.	35.00
15	281.1250	85.250	73.750d.	248s.	35.00
16	(e)	(e)	(e)	(e)	35.00
18	281.1875	85.250	73.750d.	248s.	35.00
19	281.1875	85.250	73.750d.	248s.	35.00
20	281.1875	85.250	73.750d.	248s.	35.00
21	281.1875	85.250	73.750d.	248s.	35.00
22	281.1875	85.250	73.750d.	248s.	35.00
23	(e)	(e)	(e)	(e)	35.00
25	281.1875	85.250	73.750d.	248s.	35.00
26	281.1250	85.250	73.750d.	248s.	35.00
27	281.0625	85.250	73.750d.	248s.	35.00
28	281.1875	85.250	73.750d.	248s.	35.00
29	281.1875	85.250	73.750d.	248s.	35.00
30	(e)	(e)	(e)	(e)	35.00
AVERAGES FOR MONTH					
Jan.	281.163	85.250	73.750d.	—	35.00
AVERAGES FOR WEEK					
Jan.					
6	281.094	85.250	—	—	—
13	281.175	85.250	—	—	—
20	281.175	85.250	—	—	—
27	281.150	85.250	—	—	—

Calendar Week Averages, New York Silver: Jan. 2nd, 85.250; 9th, 85.250; 16th, 85.250; 23rd, 85.250; 30th, 85.250.
(e) No market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300¢ per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075¢ for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125¢ to 0.15¢ per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered, in the East, Middle West, and West, effective Jan. 1, 1951, commanded a premium of 1.35¢ per pound over the current market for Prime Western; Special High Grade 1.50¢.

(f) Prime Western delivered where freight from E. St. Louis exceeds one-half cent.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The Daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fractions of a cent per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, as reported daily by regular suppliers, and is usually one quarter-cent below the price paid for such bar silver, this deduction being the allowance to such suppliers for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5¢ per troy ounce 1000 fine, effective July 1, 1946. London silver is pence per troy ounce, basis .999 fine.

(d) U.S. Treasury's gold price. Actual payment by the United States Treasury for gold is at .99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Behind the By-Lines...

G. P. Lutjen

Well, here's February, two months early as usual, and time for the 85th Annual Survey and Outlook Number of *E&MJ*. Number 85 may be classified as an experimental model. For one thing, this year you get to see what the authors look like. Aside from satisfying curiosity, ours as well as yours, you may find the pictures useful in other ways. If you think of any we would be delighted to hear from one and all.

Another change is the prominent display of key statistics for each commodity. With this new arrangement, you should be able to open the Review and Forecast of any commodity and put your lorgnette right on the vital figures without too much difficulty.

Because we consider the charts and curves primarily qualitative rather than quantitative, designed to show trends at a glance, we have reduced them from last years tablecloth size to guest towel size, or a few degrees above total disappearance. Where possible however, we have coupled them with the tables that give the accurate figures from which the curves were drawn.

The most important aspect of the issue, fortunately perhaps, has not been subject to finagling. The quality of the material is credited strictly to the authors. We think you will agree with us as you read this issue, that the old hands at this *E&MJ* review business have done a better job than ever, and that the authors appearing for the first time this year have stayed with the pace.

There is much in this issue for the man who likes to read between the lines, or more accurately, across the lines, in this case. We have refrained from clogging up the text with cross references, but we think that you will find it interesting to compare notes on developments that reach across commodity lines to affect sometimes competitive commodities. For instance, compare what is said about the nickel-cadmium battery in the Lead review and in the Cadmium review. Or on die-casting, put Mr. Ince's views (Zinc) alongside Mr. Lipkowitz's (Aluminum).

In addition to the birds-eye view of the metal and mineral industry, there are also those isolated nuggets of information so handy for tossing into the office bull session; like the fact that the Canadian asbestos industry spends $4-million a year on bags alone. Or that 410.5 oz of lend-lease silver are still outstanding (there's even a good chance we'll get some of it back).

A pithy idea for prospectors came to our attention through T. M. Broderick, chief geologist with Calumet & Hecla. Writes Mr. Broderick:

"I thought that I had run across just about everything in the way of presentation by prospectors of the merits of their properties, but the following is a new one for me. My correspondent, in giving the results of sampling says the following: 'These samples taken across 8 ft (shallow pit),

	Gold	Silver	Copper	Cobalt
First 3 ft	Trace	.20	5.05	.27
Last 5 ft	Trace	.40	1.63	.37
Amount across 8 ft		.60	6.68	.64

What could be fairer than that? I am tempted to write him suggesting that the next time he really give the property a fair show and take samples at even smaller intervals, say, every foot."

There might be something in this for a careful core drilling outfit.

We herewith submit a classic. This is an authentic petition for extension of leave from a soldier in the British Engineers.

To the Executive Engineer:

Respected Sir:

When I got back to the building (Job No. 729), I found that the hurricane had knocked some of the bricks off the top. So I rigged up a beam with a pulley at the top of the building and hoisted a couple of barrels full of bricks to the top. When I got through fixing the building, there were a lot of bricks left over. I hoisted the barrel back up again, secured the line at the bottom, and then went up and filled the barrel with extra bricks. Then I went down to the bottom and cast off the line. Unfortunately the barrel of bricks was heavier than I was, and before I knew what was happening, the barrel started down and jerked me off the ground. I decided to hang on and halfway up, I met the barrel coming down and received a severe blow on the shoulder. I then continued on up to the top, banging my head against the beam and getting my fingers jammed in the pulley. When the barrel hit the ground, it busted out the bottom, allowing all the bricks to spill out. I was now heavier than the barrel, and so started down again at high speed. Halfway down, I again met the barrel and received severe injuries to my shins. When I hit the ground, I landed on the bricks, getting numerous painful cuts from the sharp edges.

At this point I must have lost my presence of mind, because I let go the rope. The barrel then came down and struck me another heavy blow on the head, putting me in the hospital for three days.

Respectfully request five days leave.

The fellow and the girl charged around the corner and bumped smack into each other. They stepped back, apologized, and started up again. But they both dodged in the same direction and bumped once more. Again they started up, bumped and apologized. Finally the fellow stepped back, raised his hat and gallantly remarked, "Just once more, honey, then I really have to go."

ENGINEERING AND MINING JOURNAL

FEBRUARY, 1954

From the Crises of 1953...

A YEAR AGO, looking ahead at 1953, we believed that it would be a year of crises, one in which decisions would be taken and events transpire that would affect the mining industry's activities for years to come.

And so it has been. The world swung away from war toward peace. The pace of rearmament slackened. Consumers saw a shift from a sellers' to a buyers' market in most raw materials and in most finished articles.

Some metal prices broke sharply. A new pricing basis for zinc was tried and abandoned. A flood of imports brought on a crisis for lead and zinc that is yet unresolved. The copper price and an international tin control agreement both hung in the balance as 1953 ended.

Uncertainty plagued everyone through 1953. All one could be sure of was that 1954 would present new problems no matter how the indices of industrial activity behaved.

...A Challenge in 1954

WITHOUT VENTURING onto the thin ice of outright forecasting, one can still make out the broad outlines of the challenge the mining industry faces in 1954. As always, one can break the problem down into its economic, technological, and political aspects.

The economic challenge is, of course, how to adjust to a lower, even if steady, level of demand. In zinc, for example, until producers' stocks are cut drastically, there is going to be no rush to buy zinc. Consumption of zinc rolls along, but production needs to be, and is being, cut.

In copper, some producers have already begun to curtail output in advance of an expected decline in the rate of consumption. Wise handling of output could do much to avert a sharp drop in the copper market in the months ahead.

Also, aggressive research could be directed toward finding new markets for metals and minerals independent of military demands. The aluminum and the magnesium people are far ahead of anyone else in thus creating their own prosperity.

A lower general level of metal and mineral prices throws new burdens on engineers who must try to bring down production costs. What, if anything, can be done to bring down costs?

Let us mention roof-bolting, sand-filling, air-leg drilling, fast-delay blasting, automatic hoists, friction hoists, improved materials handling methods. All these things *have cut costs* this past year, for one mining company or another. It's hardly fair to say costs can't be cut until you've considered these ideas. On a larger scale, look for a new approach to the control of mechanical mining equipment, to be described in this publication next month.

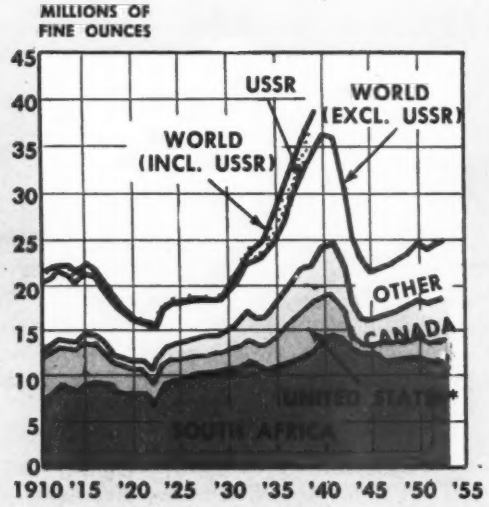
Probably mining's greatest challenge comes on the political side. What should the Government's policy be toward the mining industry? High tariff, no tariff, or a sliding-scale tax in between? Huge all-purpose stockpiles, or strategic stockpiling?

Subsidies or tax relief or both? More DMEA aid to exploration, or more indirect assistance? The Hope Bill's handling of land laws, or a really equitable, intelligent revision of the ancient mineral code?

In short, the mining industry doesn't lack for problems however the ball bounces. The challenge of 1954 puts an unusual premium on brains, ingenuity, industrial statesmanship, courage, and hard work, but it will make no demands the industry's members haven't met before and cannot meet again.

METALS

Gold Production of the World

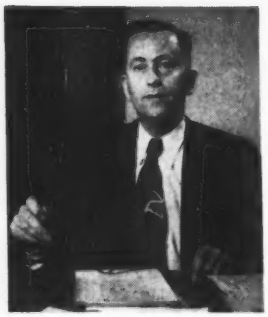


*Including Philippines through 1939.
Note: All 1953 data are provisional.

In millions of fine ounces	1940	1950	1951	1952	1953*
North America:					
Canada	5.3	4.4	4.4	4.5	4.1
United States	4.9	2.3	1.9	1.9	2.0
Latin America:					
Mexico	0.9	0.4	0.4	0.5	0.5
Colombia	0.6	0.4	0.4	0.4	0.4
Chile	0.3	0.2	0.2	0.2	0.2
Nicaragua	0.2	0.2	0.3	0.2	0.3
Africa:					
Union of South Africa	14.0	11.7	11.5	11.8	11.9
Gold Coast	0.9	0.7	0.7	0.7	0.7
Southern Rhodesia	0.8	0.5	0.5	0.5	0.5
Belgian Congo	0.6	0.3	0.4	0.4	0.4
Asia:					
India	0.3	0.2	0.2	0.2	0.2
Philippines	1.1	0.3	0.4	0.4	0.5
Australia	1.6	0.9	0.9	1.0	1.1
Total	31.6	22.5	22.1	22.8	22.8
Other countries, excluding USSR	5.1	2.2	1.9	1.9	2.0
World excluding USSR	36.7	24.7	24.0	24.7	24.8

*Tentative figures based on preliminary data.
Note: Figures may not add up to totals because of rounding.

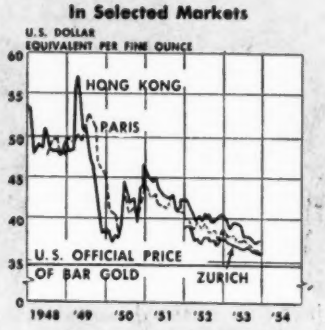
Gold



- **Increased supply, declining demand lessen flow of gold to hoarders**
- **Rising foreign dollar holdings point to better world economic conditions**
- **Easing political tensions abroad help cut free market gold prices**

DR. M. A. KRIZ
New York, N.Y.*

Bar Gold Prices in Selected Markets



National-currency quotations for bar gold converted into United States dollars at the following exchange rates for the United States dollar: Hong Kong, "free" rate; Paris, "parallel" rate; Zurich, official rate.

THE YEAR 1953 was characterized by three major gold developments. In the first place, world gold output (excluding the USSR) remained last year at about the same level—some 24.8 million fine ounces—as in 1952. The rise in world gold output of about 2.5 per cent from 1951 to 1952 thus seems to have been interrupted; however, this development appeared attributable entirely to a decline in Canadian output because of strikes that affected certain gold-mining areas.

Secondly, during the last year or two, a distinctly smaller amount of newly-mined gold than in 1951 went into industrial uses or private hoards, or was otherwise unaccounted for. The slowing down in gold disappearance seems to have reflected both an increase in supply and a decline in demand. The free market gold price moved downward, and at the year-end stood only slightly higher than the dollar parity of $35 per fine oz.—the lowest price in approximately 14 years.

Thirdly, complementing the slow-

* The author is chief of the Foreign Research Division, Research Department, Federal Reserve Bank of New York. The views he expresses are his own and are not meant to reflect those of the Bank.

ing down of gold disappearance, the recorded monetary gold reserves of the central banks and governments increased during the first nine months of 1953 by an amount equal to about one third of the current gold output, or approximately the same proportion as in 1952; in 1951 only one sixth of all newly-mined gold had found its way into official reserves—the lowest increment for any postwar year.

Another feature that marked recent changes in official monetary gold reserves was the sale of $1.3-billion of gold by the United States to foreign countries from October 1952 through September 1953; in addition, foreign countries as a whole added $0.8-billion during this period to their dollar balances and other short-term dollar assets. This reconstitution of foreign gold and dollar reserves reflects the current improvement in the general pattern of international payments, which is a prerequisite for the reestablishment of a meaningful currency convertibility. It also is a condition for any lasting genuine relaxation of discriminatory restrictions against dollar trade and payments.

1. THE RISE IN WORLD GOLD OUTPUT

World production of gold (excluding the USSR) amounted last year to 24.8-million fine oz, on the basis of preliminary or incomplete data, or merely some 100,000 oz more than in 1952 (see table). As already noted, this development appears attributable entirely to a fall in Canadian production; elsewhere output increased, even though not markedly. The estimate for 1953 is about 4.0-million oz above the 1945 postwar low, and some 11.9-million oz below the 1940 all-time record. However, current gold output is well above the 1920-1930 average, as will be seen from accompanying chart, and is about equal to the average annual output of 1934 and 1935. Over the entire period from 1945 through 1953, world gold output rose at an average annual rate of somewhat over 2%. South African output was about 11.9-million oz, as against 11.8-million in 1952 and 11.5-million in 1951. Canada's output, which remained virtually unchanged during most of last year at the 1952 level, declined somewhat toward the year-end because of strikes that affected certain gold-mining areas. For the entire year, it was probably at about 4.1-million oz, as against 4.5-million in 1952.

In the United States production rose slightly to some 2-million (on the basis of the first 11 months). In Australia and the Philippines, production increased somewhat, but in Southern Rhodesia, Belgian Congo, and Latin America it did not show any noticeable change. Very little is know about the gold output of the USSR; estimates of Russia's annual gold production vary from 2-million oz to 4-million or more.

The rise in South African output in 1952 and 1953, which accounted for almost one-half of the increase in the world output during these two years, was primarily the result of the opening of the new mines in the Far West Rand and the Orange Free State, which more than offset the decline in output of the older Rand mines. According to an official announcement, it is expected that South African gold output will increase steadily for the next ten years and that the continued development of new mines in the Orange Free State will ensure an output above the present level for at least thirty years.

Gold-mining costs continued to rise last year. Toward the year-end the average working costs per ton milled in South Africa were 6% higher than in December 1952 and 2% higher than in December 1950. Even though higher costs induced some shift in mining from lower-grade to higher-grade ore, the industry continued last year to work much lower grades of ore than before the increase in the sterling price of gold that was brought about by the currency devaluations of 1949. This was possible largely because of the introduction of new techniques and increasing efficiency, despite the growing shortage of native labor and of electricity.

Working profits from gold mining continued to decline in 1953, even though they were still about 25% above the predevaluation level.

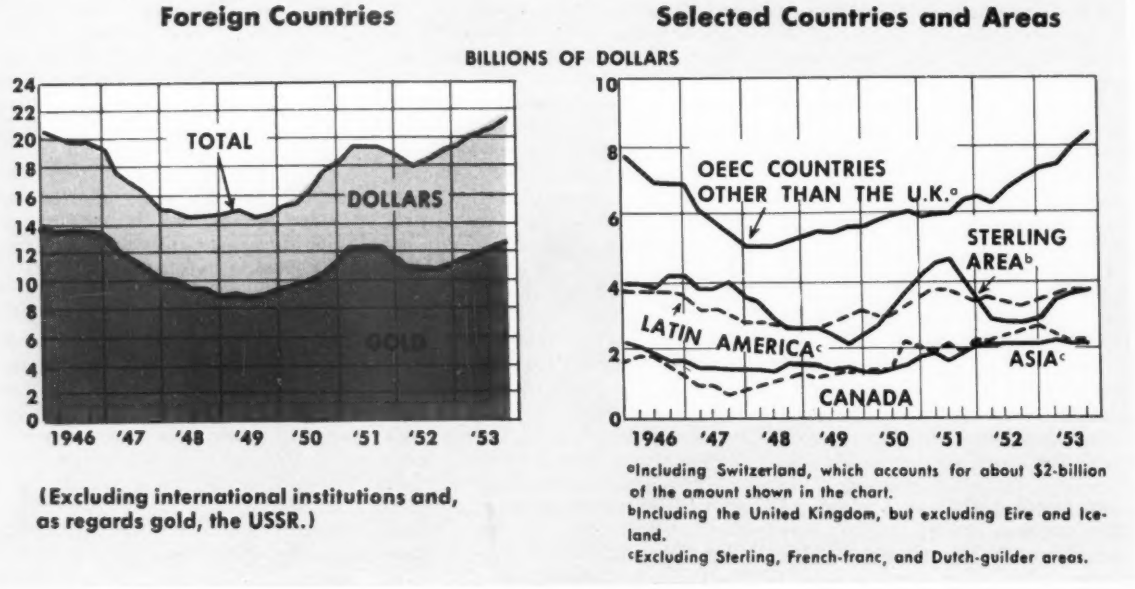
In Canada, working costs rose, as in 1952; at the same time, because of the Canadian dollar premium over the United States dollar, the price paid by the Royal Mint for Canadian gold production continued at around Can. $34 per ounce. For these reasons the Canadian Government increased last year, and renewed for 1954, its subsidies to the higher-cost gold producers so long as they channelled their entire output into the official reserves. Those who sold on the premium markets had to forego the subsidy. Also, the producers who elect to sell on the premium markets and thereby forego the subsidy were allowed last December to switch back to the subsidy after six months, instead of a year as heretofore.

From such information as is available, it appears that South Africa last year, as in 1952, sold about two-fifths of its gold output, or some $165-million, on the free markets. In Canada a larger number of gold-mining companies than in 1952 elected to sell to the Canadian Mint and receive a subsidy, instead of continuing their free-market sales; and the latter type of sales is accordingly reported to have amounted in 1953 to a much smaller proportion of output than the 30% in 1952. In most other countries, where producers were allowed to sell 100% of their output in the free markets, the bulk of last year's output was presumably thus sold. Nevertheless, the margin of profit offered by the premium markets was quite narrow last year, since the so-called free gold price reportedly fell from about $37.50 per fine ounce in January 1953 to $34.90 in the latter part of November—the lowest price in approximately fourteen years. It reportedly stood at about $35.25 at the year-end.

2. THE REDUCED GOLD DISAPPEARANCE

Less newly-mined gold went into industrial uses or private hoards, or was otherwise unaccounted for, during the last year or two than in 1951. The flow of the newly-mined gold cannot of course be traced with any great accuracy. Nevertheless, from such data as can be compiled for the world outside the USSR,* it appears that only one-third of the current gold output found its way, during 1952 and most of 1953, into the recorded gold stocks of the monetary authorities. Accordingly, perhaps as much as two thirds of the output was consumed in industry and the arts or otherwise disappeared. The rate of disappearance had been much

Gold and Dollar Holdings . . .



(Excluding international institutions and, as regards gold, the USSR.)

aIncluding Switzerland, which accounts for about $2-billion of the amount shown in the chart.
bIncluding the United Kingdom, but excluding Eire and Iceland.
cExcluding Sterling, French-franc, and Dutch-guilder areas.

larger in 1951 when perhaps as much as five-sixths of newly-mined gold had gone into industrial uses or private hoards. On the other hand, from the world-wide currency devaluations in September 1949 to the outbreak of hostilities in Korea in June 1950, over two-thirds of the current gold output had appeared in recorded official reserves, while the remainder had been accounted for almost in its entirety by the use of gold in industry, arts, and the professions. Gold disappearance during most of the past year was accordingly still much larger than at its postwar low.*

The slowing down in gold disappearance during the last year or two seems to have reflected principally a decline in demand in certain countries of Western Europe—especially France—as well as in the Middle and Far East. This decline appears attributable in the West principally to the maintenance of financial stability and the resulting increase of confidence in national currencies. In France, where the hoarding demand is known to be large, the market appeared to be saturated with the metal.

In the East, the fall in primary commodity prices and hence in incomes that followed the post-Korea boom, brought about a noticeable reduction in the hoarding demand. The closing of certain markets that formerly bought gold on a considerable scale, was another factor.

The relative easing of international political relations during most of last year seems to have been an important contributory factor in the East as well as in the West.

This reduced demand for gold coincided with the pressure of increased supplies from current output in countries other than the USSR. The Russian selling of gold on the free markets, reported during last October and November, apparently added its influence to these other factors. These broad developments on both the demand and supply sides, including the apparently marginal impact of the Russian sales, tended to depress free-market gold prices. (see chart, p 72.)

The regulations and practices governing the import and export of gold, and domestic trading in it, were variously relaxed last year. South Africa began last November to allow its producers to sell their gold in the free market in the form of fine bars, thus discontinuing the costly artifice of processing or fabricating gold before selling it. In Canada, producers who elected to sell on the free markets were allowed in December to export 24 carat-gold, instead of being permitted to sell gold only in "processed" form with a maximum fineness of 22 carats. In Japan, producers were permitted from August 1953 on to sell two-thirds of their gold output on a newly-established free market, the remaining third to be sold to the authorities at the official price.

3. THE IMPROVEMENT IN FOREIGN RESERVES

As already noted, an increased portion of newly-mined gold found its way during the last year or two into the monetary gold reserves of central banks and government. Furthermore, foreign countries as a whole acquired gold from the United States and increased their short-term dollar balances and other dollar assets. As a result, foreign gold and dollar reserves increased considerably during the year, as may be seen on charts above; indeed, by September 1953 they ac-

* In October and November 1953, the USSR was said to have sold varying amounts of gold in certain free markets in Western Europe; and toward the year-end it reportedly sold gold directly to certain Western European central banks. The flow of gold from Russia during the last quarter, in amounts that of course were not officially disclosed, does not seem to have materially affected the broad validity of the above statement regarding gold disappearance outside the USSR.

tually exceeded the level at the end of 1945, before the postwar drain on the foreign countries' monetary reserves had seriously impaired their world payments positions. The speed and extent of the improvement varied from country to country, but with a very few exceptions all major countries shared in it.

From October 1952, when the current reversal in international gold movements started, through September 1953 (the latest published data), the United States sold on balance $1,302-million worth of gold to other countries. Largely as a result of these sales the monetary stock of the United States declined from $23.5-billion in September 1952 to $22.2-billion in September 1953; in December 1953 it stood at $22.1-billion.

The rest of the world (excluding the USSR) experienced an aggregate increase in its monetary gold stocks from $10.6-billion in September 1952 to some $12.2-billion in September 1953. Including the gold stocks of the International Monetary Fund, the Bank for International Settlements, and the European Payments Union, which together amounted to $2.1-billion, the world's monetary gold reserves (excluding the USSR) amounted in September 1953 to $36.5-billion, as against $36.2-billion a year previous. Of this total, the United States held 61%, as against some 65% in September 1952 and 60% in 1945.

In addition to these monetary gold reserves, foreign countries also held dollar balances and certain other dollar assets in the United States, on both official and private account. Taking foreign gold reserves and dollar holdings together, the total increased by $2.4-billion from September 1952 through September 1953, standing in the latter month at $21.9-billion. They thus were $1.2-billion higher than in December 1945, prior to the serious depletion of the early postwar years. They were also $7.2-billion, or 49%, higher than in September 1949, the date of the general currency readjustments, and $3.4-billion, or 18%, higher than in March 1952, the post-Korea low.

Last year's rise in the combined gold and dollar holdings of foreign countries, like the decline in 1951 and early 1952, was very unevenly distributed, as is apparent from the chart. Of the five broad groups of countries and areas, Canada is the only one to show somewhat lower gold and United States dollar holdings in September 1953 than in September 1952.

The holdings by the Western European countries other than the United Kingdom that are participating in the Organization for European Economic Cooperation stood in September 1953 at $8.6-billion, as against $7.4-billion a year previous. These countries, as a whole, had been building up their gold and dollar reserves since mid-1948. Of the September 1953 total, $2.1-billion was held by Switzerland. The recent rise in the gold and dollar holdings by the group was especially marked in Germany ($454-million from October 1952 through September 1953), and the Netherlands and its dependencies (a gain of $288-million).

UK POSITION IMPROVES

The current rise in the gold and dollar holdings of the sterling area began only toward the end of 1952, but by September 1953 such holdings were $0.9-billion higher than in September 1952. The gold and official dollar holdings of the United Kingdom alone* stood in September 1953 at $2,486-million, as against $1,685-million in September 1952. They were at $2,518-million in December 1953 despite payment in December of $181-million under post-war agreements with the U.S. and Canada.

The recovery in gold and dollar reserves rests basically on the firm foundation of a record agricultural and industrial production and an abatement of inflationary pressures in large parts of the world, as well as on the gradual restoration of a stronger competitive position in much of Western Europe. More particularly, the recent improvement in the international payments position seems to have been of a sturdier character than the earlier rise of October 1949-June 1951.

In the first place, the recent rise in gold and dollar holdings has not, as in certain countries after the outbreak of hostilities in Korea, been at the cost of a general depletion in raw material stocks. Secondly, the recent improvement, in contrast to that of 1950 and early 1951, has been accomplished without a rise in prices of primary commodities originating in the sterling area. Such prices are now at about the level of mid-1950. In addition, the economies of Western Europe, Canada, and the United States have been operating at (or close to) all-time record levels.

Furthermore, the ability of the Western European and Canadian economies to cope with the problem of transferring resources to dollar-earning or dollar-saving tasks has been enhanced by their increased reliance upon monetary and fiscal policies and upon the price mechanism. The price structure, particularly in Western Europe, is also more competitive than during the earlier postwar years.

Nevertheless, several reasons still remain for caution in interpreting the recent improvement. First, by the end of 1953 the non-dollar world was still receiving grants from the United States in excess of its actual dollar deficit; and this aid is being greatly reduced. In addition, the United States Government is purchasing a large amount of goods and services abroad, including the so-called military off-shore purchases of commodities that are then donated by the United States as part of the military aid. These expenditures are relatively temporary in character. Also, to the extent that a cessation of the drain on gold and dollar holdings, or even an increase in reserves, is the result partly of more stringent exchange and import restrictions, it cannot be regarded as a sign that a satisfactory dollar balance is being established.

Yet even though it is not possible to isolate the fundamental factors working toward a dollar equilibrium from the temporary and extraneous ones, these circumstances must not be allowed to obscure the remarkable improvement in the basic international economic situation that has been achieved thus far.

Recent developments have given rise to new hope that many of the non-dollar countries will succeed in reestablishing self-supporting economies and rebuilding their monetary reserves. These developments have also strengthened the conviction that, if the recent improvement in the international payments position is to be sustained, effective policies will have to be devised, in the United States as well as abroad, to promote a much more integrated pattern of world trade.

* I.e., sterling-area central reserves of gold and United States and Canadian dollars, as made public by the British Chancellor of the Exchequer.

Silver Production of the World

Millions of Ounces	1949	1950	1951	1952	1953
Mexico	49.5	49.1	43.8	50.4	45.0
United States	34.6	42.1	40.0	40.2	35.0
Canada	17.6	23.2	24.2	25.2	30.0
Peru	10.6	13.4	14.9	17.1	17.5
Bolivia	6.6	6.6	7.2	7.1	7.5
Other Western Hemisphere Countries	7.0	7.2	6.5	6.9	7.5
Total Western Hemisphere	125.9	141.6	136.6	146.9	142.5
Outside the Western Hemisphere	48.1	50.4	62.0	62.2	60.0
World Production	174.0	192.0	198.6	209.1	202.5

Silver Imports and Exports of the U. S.

Millions of Ounces	1952	1953(est)
Imported from:		
Mexico	16.1	26.3
Canada	19.0	20.6
Peru	14.1	14.1
Bolivia	3.8	4.3
Cuba	.2	19.5
Other Western Hemisphere Countries	6.2	7.7
Europe	7.2	5.1
Japan	6.8	2.3
All Other Countries	2.3	2.1
Total Imports	75.7	102.0
Exported to:		
Cuba	2.1	5.2
All Other Countries	2.0	1.0
Total Exports	4.1	6.2

Silver

- **Eleven months without a price change**
- **Who is going to repay how much of lend-lease silver?**
- **For 1954 — Continued stability**

FRANCIS H. WEMPLE,
Assistant Secretary
Handy and Harman

Treasury Silver

Millions of Ounces	Dec. 31, 1952	Nov. 30, 1953
Held by Treasury:		
Securing Silver Certificates:		
Bullion	1631.7	1653.5
Dollars	223.8	215.8
Subsidiary Coin	3.0	4.0
Free Bullion	79.1	53.1
Total Stocks	1937.6	1926.4
Outside the Treasury:		
Dollars	156.6	164.3
Subsidiary coin	837.7	873.6
Total outside Treasury	994.3	1037.9
Total Silver	2931.9	2964.3

REVIEW

FORCES OF SUPPLY AND DEMAND in the New York silver market during 1953 remained in unusually close balance. Not since World War II, when the price was subject to government price controls, has there been so little change in the course of a year. The entire spread between the high (85¼c) at the end of the year, and the low (83¼c) ammounted to only 2c. Furthermore there were but four changes, all of which took place in January, on four consecutive days.

Trade demand in the U. S. during the first few months of 1953 was maintained at a high level. Nevertheless, offerings from non-producer sources were sufficient to prevent further price increase. Japan sold approximately 2-million oz and the Bank of Mexico, in line with its established market policies disposed of a substantial amount in the New York market. Cuba also was a regular seller of demonetized coin and important source of supply for consumers.

Demand declined moderately in April and some producers with large intakes of Mexican production found it convenient to make sales to the Bank of Mexico in the absence of adequate market orders. Later in April, Japan once again approached the New York market with requests for bids, but this time was unsuccessful because buyers here were reluctant to commit themselves for 30 to 45 days delivery. Eventually Japan negotiated a sale in London for about 3-million oz.

After the middle of the year demand in general was subjected to its usual seasonal fluctuations. During the summer vacation period, daily volume slackened considerably. Industrial requirements were adversely affected by the cutback in production in the refrigeration and consumer durable goods industries. A moderate seasonal improvement from the arts developed in late September and October, but from the middle of November until the close of the

Silver Consumption in the World

Millions of Ounces	1949	1950	1951	1952	1953
Arts and Industries					
United States	90.0	120.0	110.0	95.0	105.0
Great Britain	11.5	12.4	16.6	10.4	11.5
Germany	6.0	7.6	10.0	11.3	17.5
Canada	5.2	5.2	4.6	4.2	4.4
Japan	1.6	—	3.5	3.5	5.6
Mexico	1.2	2.4	1.0	2.2	1.8
Other Countries	17.0	9.8	17.8	15.5	18.0
Total	132.5	157.4	163.5	142.1	163.8

Millions of Ounces	1949	1950	1951	1952	1953
Coinage					
United States	13.5	24.6	44.4	57.3	42.8
Saudi Arabia	20.6	—	20.6	23.0	—
Germany	—	—	.3	8.8	—
Mexico	.9	3.8	4.5	8.3	14.1
Canada	1.2	3.4	3.1	4.2	3.9
Belgium	4.3	5.7	5.8	—	2.3
China	32.5	—	—	—	—
Other Countries	10.8	6.7	11.4	6.5	11.7
Total Coinage	83.8	44.2	90.1	108.1	74.8
Total Consumption	216.3	201.6	253.6	250.2	238.6

year, demand remained at a relatively low rate, reflecting the general decline in business activity. In spite of these conditions, Cuba had virtually completed the sale of its demonetized coin by the end of December and will no longer be a market factor. Supplies for the most part were in excess of demand, but support from Mexico prevented any accumulation in the hands of producers. As a result, the price remained firm for the rest of the year.

Total imports, based on preliminary information, into the U. S. amounted to about 102-million oz, or 35% more than in 1952. (See table). The increase is accounted for by larger shipments from Mexico and by receipt from Cuba of demonetized one-peso coins.

Total exports of 6,200,000 oz consisted largely of a shipment to Cuba of approximately 5,200,000 oz in the form of subsidiary coin minted in the U. S. The silver was obtained from stocks accumulated in New York through imports in previous years of demonetized one-peso coins. Net supplies available to the market from foreign sources amounted to about 101-million oz.

Treasury stocks of silver in bullion and in coin declined 11,200,000 oz to 1,926,400,000 oz during the first eleven months. Reduction in free stocks, together with a small reduction in silver dollars held by the Treasury were offset to some extent by an increase in silver bullion securing silver certificates. This increase resulted almost entirely from purchases of U. S. production. Silver outside the Treasury, that is in the form of coin in circulation or held by banks, increased by 43,600,000 oz.

Unobligated bullion in the Treasury, or free stocks out of which sales to industry are permitted, has been declining rapidly over the past several years, due to the requirements of the U. S. for subsidiary coin. By Dec. 31, 1953, the decline was 28,700,000 oz from the end of 1952. At this rate these supplies will be exhausted in less than two years.

DEVELOPMENTS

No payments were made against lend-lease silver during 1953, and the amount outstanding remained at 410,553,011 fine oz. There has been no change in this figure since 1947. Ratification of the Japanese peace treaty in April 1952 established the start of the five to seven year period within which such silver is to be returned to the U. S. Treasury. There is no indication that any of this obligation will be cancelled. The following table shows the amount presently owing, together with the debtor countries.

Country	Millions of oz
India and Pakistan	226.0
United Kingdom	88.1
The Netherlands	56.7
Saudi-Arabia	22.3
Australia	11.8
Ethiopia	5.4
Fiji Islands	.2
Total	410.5

The Indian government announced in 1952 it had 300-million oz in the form of stocks of demonetized coin, so it would appear that India would have no difficulty in meeting its obligation. As regards London, the Bank of England on Dec. 11, 1953 announced that it would no longer make sales to the trade for essential purposes out of official stocks, as had been the practice. It seems reasonable to assume that at least one purpose of this decision was to conserve supplies for ultimate repayment against lend-lease. Furthermore, Russia shipped 21,500,000 oz to London in the course of the year, most of which probably went directly into the stocks of the Bank of England. No information is available on how much silver the Bank has on hand, but these events would indicate that England intends to meet its lend-lease obligation. Therefore the bulk of lend-lease silver can reasonably be expected to be returned to the Treasury Department on schedule.

As the repayment dates approach, how it will be handled by the Treasury Department becomes of interest to all those in the silver industry. Under existing authorization the Treasury may use alternative accounting methods. A detailed discussion of these methods is not pertinent to this article, but it is significant that two possible results could be obtained. If the silver is brought in under the Silver Purchase Act of 1934, then 55% of it would be monetized and 45%, or 185-million oz

(*Continued on page 134*)

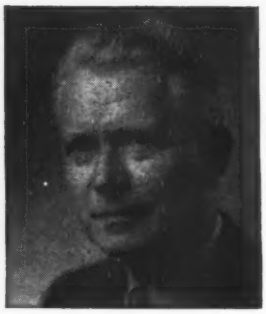
Copper Statistics

Short tons	1947	1948	1949	1950	1951	1952	1953
UNITED STATES							
Primary Production	871,391	850,088	772,986	940,249	964,589	961,886	957,434
Secondary Production	105,307	130,410	135,052	117,439	56,910	46,003	109,972
Refined Production	1,196,393	1,233,697	1,056,463	1,270,768	1,199,784	1,189,112	1,395,003
Deliveries to Fabricators	1,383,666	1,344,445	1,031,595	1,371,464	1,367,787[a]	1,445,834[a]	1,443,719[a]
Stocks Refined Dec. 31	76,035	96,080	116,027	49,040	71,528[b]	58,858[b]	89,193[b]
OUTSIDE UNITED STATES							
Primary Production	1,229,825	1,271,884	1,270,529	1,347,356	1,378,833	1,401,001	1,440,106
Secondary Production	8,995	8,526	10,241	11,387	5,360	9,583	13,238
Refined Production	1,016,856	1,072,229	1,076,114	1,127,329	1,225,018	1,196,426	1,119,966
Deliveries to Fabricators	921,851	901,073	933,641	898,601	1,013,450	1,005,259	831,341
Stocks Refined Dec. 31	143,979	175,669	147,972	139,919	152,203	130,103	280,530
COMBINED TOTALS							
Primary Production	2,101,216	2,121,972	2,043,515	2,287,605	2,343,422	2,362,887	2,397,540
Secondary Production	114,302	138,936	145,293	128,826	62,270	55,585	123,210
Refined Production	2,213,249	2,305,926	2,132,577	2,398,097	2,424,802	2,385,538	2,514,969
Deliveries to Fabricators	2,305,517	2,345,518	1,965,236	2,270,065	2,381,237	2,451,093	2,275,060
Stocks Refined Dec. 31	220,014	271,749	263,999	188,959	223,731	188,961	369,723

[a]Includes tonnages delivered from government stocks.
[b]Includes tonnages delivered to U. S. consumers at foreign ports.

This summary of copper statistics, reported by members of Copper Institute, accounts for most of the world's production. It excludes the USSR and countries behind the Iron Curtain, as well as a few countries of minor importance.

Copper



- **Buyer's market returns**
- **U. S. fabricators get almost as much copper in '53 as in '52**
- **Foreign price falls below U. S. level**

H. H. WANDERS, Market Editor

A FREE MARKET FOR COPPER became a fact during 1953 for all important producing areas except Chile. Political considerations no doubt prevented the Chilean authorities from reaching an agreement during the year in adopting a realistic policy in marketing its large output. A truce in Korea eased tension most everywhere and commodity markets, particularly those identified with the defense effort, experienced a gradual return to more normal conditions. Copper was no exception.

Demand for copper in the United States, which could not be satisfied for almost three years because of highly stimulated defense and civilian requirements, began to moderate as 1953 reached its halfway mark. During the first six months of the year, deliveries to U. S. fabricators averaged 133,969 tons a month, virtually equalling the record rate of the World War II period. However, in the second half of the year, U. S. deliveries declined to an average of 106,670 tons a month. Despite this drop, U. S. consumers obtained 1,443,719 tons of copper during the year, which compares favorably with 1,445,834 tons delivered during 1952.

An expected increase in U. S. mine output of copper did not materialize. Mine output outside of the U. S. scored moderate gains, thanks largely to an expanding production program in Africa. Production in Chile met with a setback because of numerous work stoppages. Chilean producers were compelled to operate in a "Government knows best" atmosphere, which threatened to impair the country's high standing as a dependable producer and seller of copper.

Highlights in copper for 1953:

1—Office of Price Stabilization decontrolled scrap Feb. 12.

2—Suspension of import tax on copper extended to June 30, 1954,

providing price does not drop below 24c prior to that date.

3—International Materials Conference discontinued allocations on Feb. 15 because of an improved supply situation.

4—OPS freed primary copper from price control Feb. 25.

5—National Production Authority ended quantitative monthly allocations, following decontrol of copper by OPS.

6—Commodity Exchange in New York resumed trading in copper futures on June 1 after two-year suspension.

7—Controlled Materials Plan abandoned June 30.

8—London Metal Exchange resumed trading Aug. 5 after lapse of 14 years.

PRICE MOVEMENTS MIXED

Price movements followed a pattern that tied in closely with the important events of the year. Th U. S. quotation, maintained at a relatively low level throughout the period of our major defense effort, advanced following decontrol to a level that major producers regarded as reasonable under prevailing conditions. The world price declined as the supply situation improved.

The monthly *E&MJ* averages for domestic and foreign copper, reduced to an f.o.b. refinery equivalent, in cents per pound, follow:

	1953	
	Domestic	Foreign
January	24.200	34.780
February	24.968	34.783
March	29.289	34.451
April	29.902	32.863
May	29.683	29.710
June	29.688	29.699
July	29.687	29.482
August	29.611	29.254
September	29.623	28.688
October	29.598	28.522
November	29.651	28.848
December	29.673	29.061
AVERAGES	28.798	30.845

The pricing policy of U. S. fabricators of necessity changed slowly because of inventory problems that grew out of the "package deal" imposed on the industry in the preceding year. It remained in force until the market again approached a single-pricing standard. It will be recalled that fabricators had priced their products on the 60-40% formula, to absorb the cost of domestic metal purchased at the ceiling level and the higher cost of foreign copper. So far as Chilean metal was concerned, fabricators paid up to 36½c, delivered. It was not until September that fabricators finally adjusted their selling schedules to conform to a flat 30c basis.

Wire and cable mills, as in the preceding year, consumed more than one-half of the supply. Brass mills, despite increased competition with aluminum and other products, had a satisfactory year and were favored by a trend away from substitutes in the defense program.

Copper—U.S. Statistics

Tons	1952	Estimated 1953
Mine output	925,377	923,000
Smelter production	1,007,889	1,067,406
Refined production	1,189,112	1,395,000
Net imports	439,560	565,000
Deliveries to customers	1,445,834	1,443,719
Average price per lb., E & M J	24.200c	28.798c

NET IMPORTS ROSE

As tension on the international political front eased, offerings of copper increased. European operators began to restrict their purchases, taking a bearish stand on prices. The flow of copper to the U. S. from sources outside of Chile increased. Rhodesian producers were sellers here, and even Katanga, operating in the Belgian Congo, penetrated this market. Shipments from Canada increased substantially over 1952. This development proved most embarrassing to the Chilean officials who had yet to face a buyers' market in copper.

Net U. S. imports for 1953, when final figures become available, should surpass 1952 by a wide margin. The imports and exports for 1952 and the ten months ended October 1953, based on figures compiled by the Bureau of the Census, in tons, follow:

	Jan.-Dec. 1952	Jan.-Oct. 1953
IMPORTS:		
In ore, matte, etc.	105,196	101,513
Blister (content)	162,189	248,400
Refined copper	346,958	255,127
	614,343	605,040
EXPORTS:		
In ore, etc.	648	465
Refined copper	174,135	80,874
	174,783	81,874
NET IMPORTS	439,560	523,701

During the ten months ended October, Chile exported 112,450 tons of blister copper to the United States, against 55,543 tons during all of 1952. Most of this metal was shipped by Chile Exploration from production at its new sulphide plant. Imports of refined copper from Chile in the Jan.-Oct. period of 1953 totaled 141,645 tons, which compares with 294,425 tons imported during all of 1952. Most of the refined copper that originated in Chile was brought into the country during the first half of the year.

Effective April 23, *Engineering and Mining Journal* eliminated from its pricing system on foreign copper the abnormally high price fixed by the Chilean Government for the sale of its copper. Major foreign producers and custom smelters, situated outside of Chile, had offered copper freely in all markets at prices well below Chile's arbitrary price of 35½c, f.o.b. port of shipment.

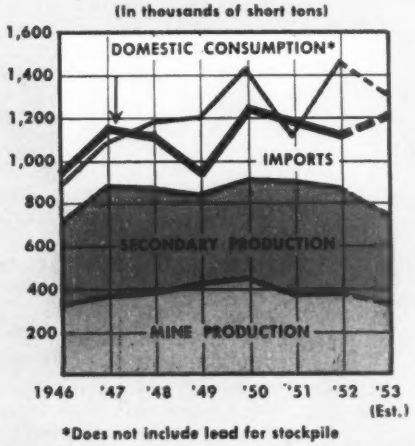
That an easier supply situation prevailed in copper was recognized most everywhere. Early in May, Sir Arthur Salter, Minister of Materials for the U. K., informed the House of Commons that the import and sale of copper in the U.K. was to revert to private hands on Aug. 5, thus ending the period of bulk buying for the British.

LONDON RESUMES

Even before the London Metal Exchange opened its doors to trading in copper, those speculatively inclined were extremely bearish on the outlook for the remainder of the year. This feeling was fully reflected in the bid and asked prices named at the first session as the Exchange opened. An unexpected demand for copper from European sources later in the year reversed the trend and subsequent covering by shorts resulted in a

(Continued on page 136)

Lead—Supply and Demand in the United States



*Does not include lead for stockpile

(In Short Tons)	1952[1]	Estimated 1953
SUPPLY		
Domestic ores	390,000	335,000
Foreign ore and base bullion	105,000	165,000
Secondary[2]	456,000	430,000
Imports of metal	511,000	385,000
Delivered from stockpile	7,000	
Total supplies	1,469,000	1,315,000
DEMAND		
Industrial consumption	1,131,000	1,200,000
Increase in consumers' stocks	16,000	—10,000
Total industrial demand	1,147,000	1,190,000
Excess of supply over demand	322,000	125,000
Increase in stocks at primary smelters	25,000	45,000
For stockpile and unaccounted for	297,000	80,000

[1]American Bureau of Metal Statistics and U. S. Bureau of Mines
[2]Does not include secondary lead in brass or bronze

Lead

- **Paradox: High consumption but hard times**
- **Protection: A year-long tariff debate**
- **Porcelain: Enamel for aluminum could open a lead market**

ROBERT L. ZIEGFELD, Secretary
Lead Industries Association

THE YEAR 1953 IN LEAD offered the paradox of high, nearly record consumption in the United States combined with a lower price and considerable hardship to lead producers. Also unlike most recent years, 1953 was devoid of violent fluctuations in price.

REVIEW

Lead entered the year at 14.75c per lb, dropped by steps to a low of 12c on April 20, rose again by steps to 14c in July 23, and settled back to 13.50c on Sept. 16, where it remained for the balance of the year. These lower prices eventually took their toll of production, particularly among those who produce both zinc and lead because of the even lower zinc prices that prevailed.

Total lead supply in this country was some 145,000 tons less than in 1952. At the same time United States consumption soared to near record levels, about 1,200,000 tons. The apparent excess of supply over demand dropped from more than 320,000 tons to about 125,000 tons. Producers absorbed, in addition, about 45,000 tons in increased stocks, leaving about 60,000 tons for stockpile and unaccounted for against nearly 300,000 tons a year earlier, when government stockpile purchases were a great deal heavier.

Domestic mine production at the end of the year was running some 20% behind the rate in earlier months and production for the full year sank to 335,000 tons, nearly 15% less than in 1952. (Production figures for 1952 are given in accompanying table). Many high cost producers were completely shut down or had drastically curtailed production.

Secondary lead production contracted moderately—off 4½%.

Imports in the first eight months of 1953 just about kept pace with the record 616,000 tons for 1952, but showed a marked drop thereafter. Chief causes were moderate curtailment of mine production abroad and particularly, of improved buying there, with Mexican and Canadian lead again finding a market in Europe. Net result was a 10% decline in imports to an estimated 555,000 tons.

Consumption in the lead picture has been anything but depressing. Near its all-time peak in 1953, it reached about 1,200,000 tons, or about 6% over 1952. Storage batteries, cable sheathing, building (including caulking lead), tetraethyl lead, ammunition and solder all showed appreciable increases during the year. Even foil, which is small, tonnage-wise, compared with what it was before the war, consumed more than twice as

much lead as it did a year ago. The trade attributes this almost entirely to the lower price of lead.

Storage batteries made a good showing, particularly during the first half, and the year ended with an estimated 23,500,000 replacement batteries shipped compared with about 22,500,000 last year. With the high rate of automobile production and registration in recent years there is little reason to expect anything but large consumption of lead in this field.

Lead sheathing showed an estimated increase of 4,000 tons in 1953, despite the publicity which aluminum and plastic cable sheathing has had, and the inroads made by such substitutes in certain types of cables. Many well-informed men in the cable industry feel that much must be done to remove objectionable features of substitutes.

Tetraethyl lead showed the biggest increase, 15,000 tons or about 10%. While new gasoline additives, such as TCP and others, have been introduced recently, these are complementary to, and not competitive with, tetraethyl lead.

Solder. The jump of 9,000 tons in consumption of lead in solder may seem surprising, but the trend to higher lead and lower tin content solder has persisted since the war. For example, the average lead content has risen 15% in the last 10 years. Thus while other methods of joining sometimes supplant soldering, the lead per joint and number of joints by all methods have made up the difference.

TARIFF DEBATE

Because of the abnormally heavy imports in 1952 which continued through much of 1953, and the depressed state of a large segment of the domestic lead mining industry, the tariff and other protective means became live topics during the year. One result was introduction into Congress of the first Simpson Bill, H.R. 4294, which combined a sliding scale tax on lead and zinc imports with a measure to extend the Reciprocal Trade Agreements Act. The effect of this bill would have been to add 1c per lb tax on lead imports for each cent below 15c per lb that the domestic price fell. This was a plan that had been advanced by the National Lead and Zinc Committee, composed of lead and zinc miners in twenty states.

Opposition, however, caused the bill to be split into two measures, the part extending the Trade Agreements Act, with modifications, becoming law, and the part dealing with the sliding scale tax being defeated. The National Lead and Zinc Committee took further steps to protect the domestic industry by appealing to the United States Tariff Commission under the Escape Clause of the Trade Agreements Act. Resolutions of the House Ways and Means Committee and the Senate Finance Committee also directed the Commission to make a study to determine whether relief should be granted. The Commission held hearings in Washington in November at which many witnesses appeared both for and against greater protection. A recommendation is not expected until March and the Commission's recommendation can be overridden by the President.

Maximum relief that can be recommended is to increase the duty on lead ore from the present ¾c per lb. to 1.8c and on pig lead from 1 1/16c to 2.55c. Import quotas may also be recommended but the industry itself apparently does not favor quotas as too difficult and complicated to administer.

Some opponents of the increased tariffs and the sliding scale tax have proposed a limited amount of direct subsidization of high cost domestic mines to alleviate the hardship, with excess production being subsidized. Still another proposal has been a moderate tariff increase with tariff receipts used to subsidize domestic miners. Thus the subsidy would increase as imports increased and vice versa.

FORECAST

Mine production in 1954, from present indications, should be less than in 1953, unless increased price or other incentives are provided.

The lead consumption picture is reasonably optimistic, assuming no great recession in business generally.

Utilities are planning continued large-scale expansion.

Construction expects another year of high level activity.

Storage batteries should continue strong. The last year saw a trend develop toward 12-volt instead of 6-volt batteries, which use about 40% more lead per battery. Of course the effect of this will be mainly temporary and longer life will be a compensating factor.

Considerable publicity given to nickel-cadmium batteries late in the year indicated that they will be in production for automobiles soon. While recognizing that these batteries have certain merits and have corrected some objectionable features, they still don't seem a threat to the use of lead for the great mass of automotive batteries, at least for a long time to come. For one thing, cadmium and nickel seems to be in too limited supply for general replacement of the lead acid battery market.

Tetraethyl lead, with continued greater use of automobiles and airplanes and higher compression engines, seems destined for continued growth.

New uses: There is a new use of lead that has recently attracted attention. It is as an important, and, as yet, essential ingredient as an oxide or other compound in porcelain enamel for aluminum. If, as many believe, porcelain enamelled aluminum goes over in a big way for building exteriors, signs, and other applications, sizeable tonnages of lead could be involved.

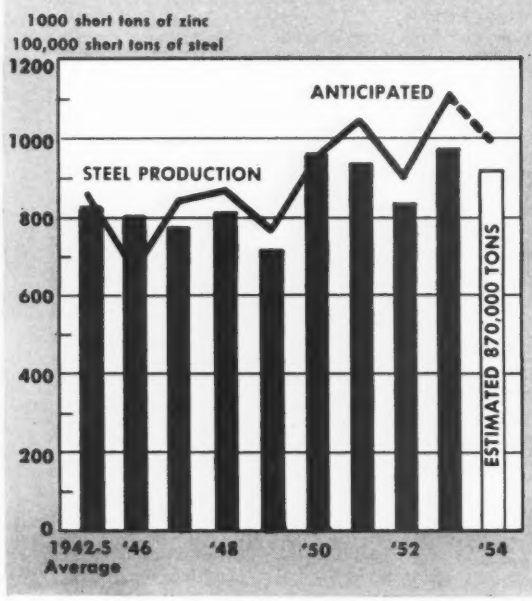
Use of Lead in the United States[a]

(In Short Tons)	1952	Estimated 1953
White lead.	22,900	19,700
Red lead and Litharge[b]	76,700	78,000
Storage batteries	351,000	380,000
Cable.....	142,600	147,000
Building[c]..	58,100	60,000
Tetraethyl.	146,700	162,000
Ammunition	36,200	44,000
Foil.....	2,100	4,600
Bearing metal....	36,500	38,000
Solder.....	72,700	82,000
Typemetal.	27,400	24,000
Calking....	45,200	47,600
Other uses.	112,900	112,900
Total .	1,131,000	1,200,000

[a] Based on U.S. Bureau of Mines Statistics
[b] Exclusive of oxides for storage batteries
[c] Chiefly pipe, sheet and extrusions. Includes lead used in chemical construction.

Slab Zinc in the United States

Consumption



Supply and Demand

In tons	1952	Estimated 1953
SUPPLY		
U.S. primary and secondary production	961,000	965,000
Imports	115,000	232,000
	1,076,000	1,197,000
less exports	56,000	13,000
less Govt. account	40,000	43,000
Available for consumption	980,000	1,141,000
CONSUMPTION		
Galvanizing	375,000	405,000
Die casting and zinc-base alloys	236,000	300,000
Brass products	155,000	178,000
Rolled zinc	51,000	54,000
Oxide plants & other	31,000	38,000
	848,000	975,000
SURPLUS	132,000	166,000

Zinc

- **Consumption broke a record**
- **U. S. mining suffered from low prices**
- **For 1954 — Less demand but a higher price**

CHARLES R. INCE,
Vice President & Sales Manager
St. Joseph Lead Co.

ZINC SURPLUSES which materialized quite suddenly in the middle of 1952 continued into 1953 and were responsible for the paradoxical situation in the U. S., of a good demand but depressed prices.

REVIEW

Return to a free market in the United Kingdom and resumption of zinc trading on the London Metal Exchange on Jan. 2 after a lapse of thirteen years, offered ample evidence of the over-supply of zinc in World markets, and had a marked influence on the course of the U. S. market.

The Exchange opened at £96 per long ton (12c per lb in U. S. currency) well below the £110 quoted on the Continent, but dropped to £76 (9½c per lb) by the end of March. A comparable reduction took place in the U. S. Starting the year at 13c per lb East St. Louis basis, the price dropped to 11c during March under the impact of imports and the declining foreign market.

Subsequently, with a more orderly liquidation of the Ministry of Supply's surplus stocks, the London Exchange leveled out at £68 to £72 and the U. S. market held at 11c until September. A drop in domestic demand then caused a further decline to 10c a pound, where it remained for the balance of the year. Late in the year the London price improved to £74 to £76 on the strength of increased consumption in the U. K. and renewed buying abroad. At this level, common grade zinc was selling at 9¼c to 9½c a pound delivered European ports with premiums for higher grades, compared to a U. S. price of 10c East St. Louis. This differential, due to duty and transportation costs, precluded the offering of foreign metal at discounts below the domestic price, reversing the situation which existed at the beginning of the year.

Foreign supplies to this country

could well have depressed the domestic market even further if it had not been for the high rate of consumption all year, particularly in the first six months. During that period, with industrial activity running at a peak peacetime rate of 240 on the Federal Reserve Board Index, zinc consumption averaged nearly 90,000 tons a month, also a record. In the last half, as industrial activity declined, consumption of zinc fell off to about 75,000 tons a month. Nevertheless, consumption for the year as a whole is estimated at 975,000 tons, an increase of 15% over the previous year and topping the 1950 peak of 967,000 tons.

All phases of the zinc-consuming industry participated in the increase.

Galvanizing accounted for around 405,000 tons—an increase of 8% over the previous year. While this was expected in view of the 1952 steel strike, it did not fully reflect the 17% increase in galvanized sheet shipments which might indicate a trend toward lighter zinc coatings. This would be unfortunate in view of the evidence that "the life of the sheet is proportional to the weight of the coating." What influence expanded use of continuous galvanizing lines may have on this situation, is difficult to say. As of Dec. 1, thirty of these lines were operating, under construction or planned, as compared to thirteen years ago. Regardless of the impact of these lines on overall consumption in galvanizing, it is becoming increasingly evident that they strongly influence production and distribution of grades. Heretofore, the galvanizing industry has been the main consumer of Prime Western metal, resulting in a demand for that grade which could be met in times of shortage, by debasing High Grade zinc. The current trend appears to be toward higher purity, or "tailor-made," metal and since Prime Western cannot be readily up-graded, it looks as if Prime Western will be the grade in most ample supply, reversing the situation which has existed for many years.

Die casting, which has become second largest consumer of zinc, required approximately 300,000 tons, the highest consumption in the history of the industry and an increase of 27% over the previous year. This is not surprising in view of the high rate of motor vehicle production (second only to 1950) which accounts for 60% of the use of die castings. While automotive production in the coming year is expected to decline 10% to 15%, increased use of zinc die castings, about 15% per unit, should offset this decline. The expanding use of zinc for die casting beyond the general increase in industrial activity is also evidence that this comparatively new tool "the shortest distance between raw material and finished product"—is continuing to grow. Furthermore, the competitive position of zinc pricewise with aluminum, was the most favorable in years, as can be seen from the graph on "Relation of Primary Metal Prices."

The brass industry, accounting for not quite 20% of the market, consumed 178,000 tons, an increase of 15%. This not only reflected the higher rate of industrial activity but greater availability of copper.

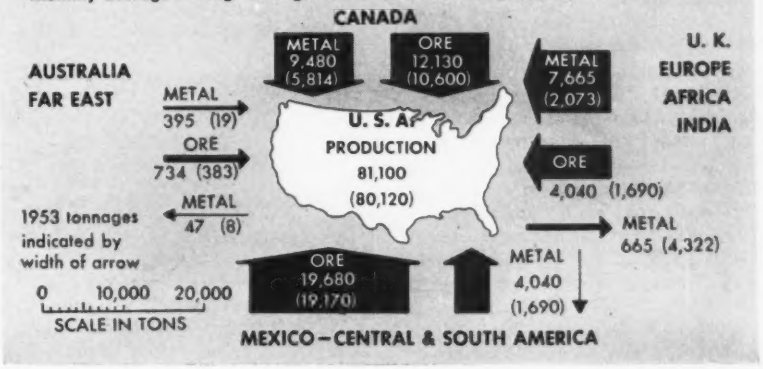
Rolled zinc accounted for about 54,000 tons in 1953, a gain of 7% while French Process zinc oxide and all other uses consumed 38,000 tons, an improvement of 20%. It should be pointed out that French Process zinc oxide (i.e. oxide made from metal) accounts for only a small portion of zinc oxide production. While 20,000 tons of metal were used for this purpose, 148,000 tons of lead-free zinc oxide, produced directly from ore, was shipped in 1953, an increase of 5%. This increase is reflected in the phenomenal year enjoyed by the rubber industry which consumes roughly 50% of production.

(Continued on page 134)

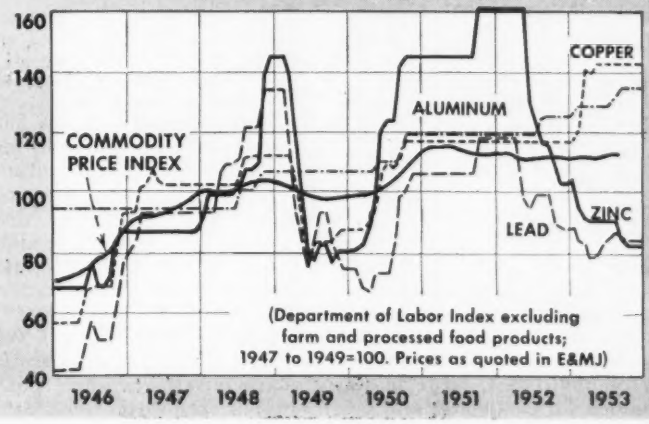
Zinc Exports and Imports

Recoverable Zinc Content of Ores and Concentrates

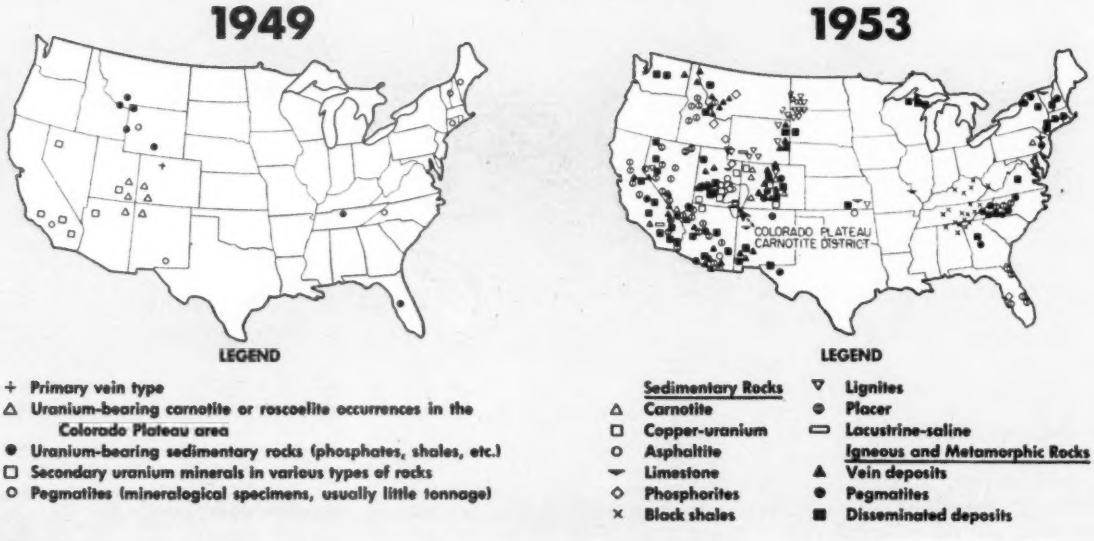
Monthly average tonnage through October, 1953 (Averages for 1952 in parentheses)



Zinc Price in Relation to Other Metals and Wholesale Commodity Price Index



Known Uranium Occurrences in the United States



Uranium

- **Unprecedented number of new discoveries made in 1953**
- **Assured market and favorable profits attract risk capital**
- **Geologic horizons for uranium finds continue to expand**

DONALD L. EVERHART
Chief Geologic Branch
Division of Raw Materials
U.S. Atomic Energy Commission

REVIEW

IN THE URANIUM INDUSTRY, 1953 was marked by an unprecedented number of significant new discoveries and extensions of known orebodies and districts — indicating that the ten-year intensified build-up in uranium exploration experience and technique is coming into fruition. Success was enjoyed by many uranium seekers including prospectors, geologists operating on their own, large mining companies, oil companies and government geologists in several of the free nations.

Three trends indicate that the rising discovery rate and increase in ore reserves will continue:

1. Important new deposits demonstrate an increasing diversity in their geologic setting and character. Ten years ago uranium geologists thought mainly in terms of two types of "commercial" orebodies — hydrothermal vein deposits with typical mesothermal characteristics; and the then unique carnotite orebodies in the Salt Wash sandstone member of the Morrison formation of the Colorado Plateau. Since then uranium in commercial quantity has been found in almost every type of ore deposit classified in textbooks, and contained in a wide range of uranium minerals with diversified mineral associates.

2. Variety and complexity of ore types are increasing. Uranium metallurgists are being faced with new and often-times difficult milling problems as a result, and flowsheets require frequent changes.

3. Discovery of a significant number of large uranium orebodies containing hundreds of thousands of tons of ore or more will eventually result in profits of several millions to mining companies. The uranium mining industry has now reached the stage where it is attracting large amounts of risk capital.

4. The year saw a marked advance in the use of geologic, geochemical, and geophysical techniques for finding new orebodies and extensions. Much has been learned about geological factors controlling ore deposition. Geochemical and geobotanical prospecting was applied intensively in some areas for the first time. Methods for radio-metric detection from the air, on the surface and in drill holes were improved. An attempt was made to adapt sev-

Classification of Uranium Deposits

(Categories starred (*) were prominent in 1953 discoveries and developments.)

Uranium Deposits in Igneous Rocks

A. Vein deposits in felsic intrusives
- *1. Uraninite (pitchblende) in siliceous-pyrite-galena veins
- 2. Uraninite (pitchblende) in nickel-cobalt-copper-silver veins
- *3. Davidite in siliceous titanium-rich veins

B. Vein deposits in extrusive rocks
- *1. Uraninite in veins cutting basalt
- 2. Uraninite in veins in andesite
- 3. Uraninite in veins cutting rhyolite

C. Uraniferous pegmatites

D. Disseminated deposits in igneous rocks
- *1. Brannerite in granite
- 2. Uranium phosphates in extrusive rock.

Uranium Deposits in Sedimentary Rocks

A. Disseminated deposits in fluviatile sandstone and conglomerate formations
- *1. Uraninite-vanoxite deposits
- *2. Copper-uranium deposits
- 3. Uraniferous asphaltite deposits
- *4. Carnotite deposits
- *5. Deposits of "secondary" hydrous uranium oxides

B. Deposits in shales
- 1. Disseminations of uranium minerals in shales adjacent to fractures
- 2. Uraniferous black shales

C. Deposits in calcareous sediments
- 1. Disseminated uranium minerals in limestone adjacent to fractures
- 2. Uraniferous phosphatic sediments

D. Uraniferous lignite deposits

E. Uranium minerals in placers

Uranium Deposits in Metamorphic Rocks

*A. Uraninite disseminated in quartzite and metaconglomerate

B. Deposits in metasediments (schists)
- 1. Vein deposits
- *2. Disseminated deposits

C. Vein deposits in amphibolites

eral "standard" geophysical techniques used in petroleum and base-metal exploration to uranium exploration.

Uranium Ore Types. New uranium discoveries are constantly increasing the number of classified types of orebodies. See the accompanying table which is the latest tally incorporating all significant new discoveries.

SEDIMENTARY ORE DISCOVERIES

Discoveries of ores fluviatile sandstone, mudstone and conglomerate beds have perhaps been of greatest interest in 1953. These are briefly as follows:

Utex Exploration Co. Discovered in July 1952 by Charles A. Steen, independent geologist. Drillholes revealed 14 ft of high-grade uraninite-vanoxite ore in Chinle formation. Shipments during first seven months of 1953 total about 16,000 tons of ore averaging 0.51% U_3O_8. Rate of delivery still sharply increasing.

Cal-Uranium Co. Exploration by private parties and AEC turned up other significant finds near the Utex property. The most important of these rivals the original Utex in size, and lies 14,000 ft northwest of it. This orebody was found by AEC drilling on the Southwestern Development Co. property (later the Cal-Uranium Co.) This property is now being developed through a vertical shaft collared in November. At last count 21 rigs, operated by private companies, are drilling in this area. All large orebodies found are in the Chinle formation, with orebearing horizons, varying from 3 to 25 ft thick. The ore appears to favor old scours in the variegated mudstone and siltstone, intraformational conglomerates and fine to medium-grained cross-bedded sandstone of the formation.

Jackpile Mine. During 1953 Anaconda Copper Mining Co. was busy drilling out an important deposit of sandstone-type ore in the Westwater member of the Morrison formation at the Jackpile property situated about midway between Grants and Albuquerque, N.M. Mining thickness varies from 6 to 20 ft, with a sizeable halo of low-grade material enclosing higher grade ore. Reports say the company will use open-pit methods involving the stripping of more than 100 ft of overlying bedrock.

Jo Dandy Area. U.S. Geological Survey diamond drilling in this area on the southwest side of Paradox Valley, Colo., has blocked out several hundred thousand tons of indicated and inferred relatively high-grade carnotite-sandstone ore. Most of the reserves are in a single deposit in the Salt Wash member of the Morrison formation.

Wyoming Discoveries. At least three general mineralized districts in Wyoming now have definite commercial possibilities as a result of new discoveries during 1953. Following earlier finds in the southern part of the Black Hills, exploration was pushed in the northern part. Homestake Mining Co. has developed several promising mines and prospects near Carlile, Wyo. In the New Haven, Wyoming, areas, carnotite in consistent beds, 5 ft thick, is associated with limonitization, carbonatization, and silicificaton of sandstone.

Exploration was carried out in Converse County in the Southern part of the Powder River Basin and an extension of 1952's activity in the Pumpkin Buttes area further to the north. Kerr-McGee Oil Industries Inc. used airborne radiometric methods, and drilled and developed a few select deposits. In this district many concentrations of carnotite are scattered throughout a large exposed area of sandstones of the lower Wasatch formation. Among the more promising of these is Kerr-McGee's D-9 (or Dead Cow) prospect where several thousand tons of carnotite ore in mineralized thicknesses of 2 to 8 ft are indicated.

A siege of "uranium fever" was sparked off in the Wind River, Wyo., area where prospector Neil McNeic discovered high-grade radioactive sandstone near the Gas Hill anticline. Since then, new finds have been reported in numerous spots within a 50 mi radius of the original discovery. Uranium minerals are disseminated in consistent bodies through several sedimentary formations ranging from Morrison (Jurassic) sediments to middle-Eocene sediments.

GEOLOGIC CONTROLS

Lithologic Control. With known deposits extending stratigraphically into sediments from Permian to middle Tertiary in age over several states it has been established according to AEC geologist Robert J. Wright that most of the ore:

1. is in arkosic sandstone.
2. is in fluvial sandstone
3. is *not* red, i.e. apparently not high in hematite content.

4. contains carbonized plant matter

Channel Control. In many fluvial formations, particularly on the Colorado Plateau, the bottoms of old stream channels that laid down the sediments have a marked effect upon the emplacement of ores. Channel control has been studied, and mapped effectively during 1953 in exploration work.

Fracture and Fault Systems. More attention is being given to the relationship of fracture and fault systems to ore distribution. New developments in the southern Black Hills, and the Grants, N.M., district have renewed interest in this type of geologic control.

GEOPHYSICAL METHODS

Scores of light slow-flying aircraft are being used in many areas to conduct sensitive scintillometer surveys. Outstanding success with this equipment has been chalked up by Kerr-McGee, Anaconda, Jenkins and Hand, and the AEC.

Electric drill-hole logging by direct contact or induction is now yielding valuable additional information on permeability and porosity of sands from non-cored drill holes. AEC has developed a prototype electric logger for extensive use in non-core drill-hole exploration.

Reflection seismic techniques have yielded no definitive results thus far. Resistivity methods aimed at direct ore finding were under way at the end of 1953.

GEOCHEMICAL TECHNIQUES

Both AEC and USGS have been studying geochemical haloes of minor or trace elements enclosing typical carnotite-sandstone orebodies to determine their value in indicating ore.

DRILLING METHODS

John P. Kellogg's paper "Exploration Drilling Techniques on the Colorado Plateau" issued by AEC from Grand Junction in April 1953 summarizes this phase of exploration methods fully. The paper points out that wagon drilling and diamond drilling are being used concurrently. Overall ratio of usage is about 5½ ft of diamond drilling to 1 ft of wagon drilling. Drilling depths have increased to a present day average of nearly 200 ft and a maximum of over 700 ft. Wagon drilling is confined to depths less than 200 ft.

MILLS AND ORE-BUYING STATIONS

The following leaching plants producing uranium oxide concentrates are now in operation:

Anaconda Copper Mining Co., Bluewater, N. M.

Climax Uranium Co., Grand Junction, Colo.

AEC mill, operated by Galligher Co., Monticello, Utah.

U. S. Vanadium Co., Rifle, Colo.

U. S. Vanadium Co., Uravan, Colo.

Vanadium Corp. of America, Durango, Colo.

Vanadium Corp. of America, Naturita, Colo.

Vitro Chemical Co., Salt Lake City, Utah.

In addition present plans call for the construction of a new mill at Shiprock, N. M., by Kerr-McGee. Preliminary planning is also under way for new mills at Moab, Utah; Paradox Valley, Colo.; and in the White Canyon area, Utah. AEC has set up orebuying stations at Edgemont, S. D. and Marysvale, Utah. AEC hopes to double the capacity of the Monticello plant; U.S.V. is actively planning an increase in capacity of the Uravan mill: and Climax is considering enlargement of its plant.

VEIN TYPE DISCOVERIES

Although secondary in productive importance to the sedimentary ores in the U. S., two domestic pitchblende vein deposit districts yielded interesting exploration results last year.

The Marysvale district, Utah, was the only consistent producer of pitchblende ore from vein deposits in the U.S. Most of the production came from VCA's Prospector and Freedom mines. Several new ore-bearing veins and important extensions of known ones were found throughout the district. The New Bertelson Cut on the slope below the Freedom shaft collar explores a new well-mineralized vein in quartz monzonite that promises to become a consistent ore producer. Another new mineralized zone was explored in the Potts mine along the northern projection of the Freedom No. 2 vein, in rhyolite. Another ore-bearing structure along a rhyolite dike was opened on VCA's property southeast of the Prospector shaft. New high-grade ore was found near the rhyolite contact on the slopes above the Prospector and Freedom openings, and two ore shoots on the 300 level of the Prospector merged into one on the 400 level. Development work continues at VCA properties.

The Ralston Creek mine, northwest of Golden, Colo., was developed during 1953 into one of the most promising high-grade uranium vein deposits brought to light in the U. S. in recent years. Pitchblende occurs here along flat-lying shears and fractures in silicified breccis.

The Radium Hill mine, South Australia, which has been explored and tested extensively during the past 10 years, became a producer in 1953. The titanium-uranium mineral davidite occurs in subparallel veins in shear zones.

DISSEMINATED URANIUM DEPOSITS

In South Africa's Witwatersrand, plans have been announced for the construction of plants for the treatment of uranium from current tailings of 14 plants at a capital cost exceeding $100-million. The first of these plants, West Rand Consolidated Mines, Ltd., started producing in 1952, and several others are now in production.

The Gunnar Gold pitchblende deposit in the Beaverlodge district of Canada shows increasing promise with each drill hole. Many geologists who have inspected it believe that it may prove to be one of Canada's largest. The ore consists of extremely fine-grained uraninite disseminated in a hematized and carbonatized sodic granite host rock which lies along a contact zone between a granite gneiss cap rock and a paragneiss footwall.

The uranium discovery during April 1953, at Blind River, Ontario, in the pyritic conglomerate at the base of the Mississagi quartzite, has now been expanded so that more than 70 mi of outcrop are reported to be sufficiently abnormally radioactive to encourage prospecting and exploration of the entire outcrop length. Production possibilities are encouraging.

Titanium

- **Military demand depletes Government's revolving-fund stockpile**
- **ODM boosts titanium sponge expansion goal to 25,000 tons per year for 1956**
- **DMPA will advance up to $24.9-million to Cramet for new sponge plant**

ALFRED F. TUMIN, Commodity-Industry Analyst, Bureau of Mines

MILITARY DEMAND for titanium metal in 1953 caused depletion of the Government's revolving fund stockpile; reimposition of controls on civilian consumption; greater interest in plant construction to produce titanium; and the upward revision of ODM's expansion goal for titanium sponge to 25,000 short tons per year in 1956. Sponge production for 1953 is estimated at 2,300 tons compared with 1,075 for 1952. This estimate includes material from E. I. du Pont de-Nemour's Newport plant; Titanium Metals Corp.'s Henderson plant; and U. S. Bureau of Mine's Boulder City plant. Under a DMPA contract, the Bureau's plant plans to produce 180 short tons of ductile titanium at a rate over 1,000 lb per day.

Expanding Production. Cramet Co., Chattanooga, Tenn., subsidiary of the Crane Co., contracted with the DMPA to construct and operate a plant to produce 30,000 short tons of titanium sponge over a 5-year period. DMPA will advance up to $24,950,000 for construction and equipment costs, to be paid with interest as sponge is produced. Other Government contracts call for the production of 18,000 tons of sponge over a 5-year period at Titanium Metals Corp.'s Henderson plant; and 13,500 tons over a 5-year period from Du Pont's Newport plant. The latter tonnage is in addition to private production facilities that have a 5-year capacity of 4,500 tons.

Rem-Cru Titanium Inc., Midland, Pa., expects to increase melting and fabricating capacity 300%, to 10 ingot-tons of metal per day, during the first half of 1954. Mallory-Sharon Titanium Corp., Niles, Ohio, has developed a new melting process ("S" method) which holds down carbon content in the metal, and cuts down sponge scrap loss. United Research, Inc., Long Island, N. Y., has developed an electrolytic process, reported to be unique, and is building a pilot plant with capacity of 3,000 to 5,000 lb of titanium per year.

Titanium scarcity. GSA's $5-million revolving fund for purchase and resale of not more than 1-million lb of sponge at a price not to exceed $5 per lb, started off with an accumulation of 298 tons in January 1953 but this stockpile was depleted due to heavy demand.

Titanium sponge, tubes, extrusions, and alloys were designated as "scarce materials" by NPA order on Feb. 18, 1953; then removed from this status on June 18, and reinstated on July 16. A Business and Defense Services Administration order placed controls on sponge and metal in the civilian market on Nov. 18.

Japanese titanium sponge production for the fiscal year starting April 1, 1953 is estimated at 160 metric tons. This includes production from Osaka Titanium Co.'s new $1.5-million plant, and from plants of Japan Electrical Metallurgical Co., Nippon Soda Co., and Mitsui Metal Mining Co.

Pigment production increased 6% during 1953, and shipments, 14% over 1952. Glidden Co., Cleveland, Ohio, signed an agreement with Ishihara Chemical Co., Japan, to provide technical assistance for the new $6-million titanium dioxide plant now under construction midway between Tokyo and Osaka, Japan. The Glidden Co. will receive a down payment and royalty payments in return for services. Calco Chemical Division, American Cyanamid Co., announced plans for a new $14-million pigment plant near Savannah, Ga. Du Pont also plans titanium-pigment facilities at Newport, Del.

Domestic ilmenite output in 1953 of 481,000 short tons, containing 242,000 tons of TiO_2, decreased 9% from 1952 production. Ilmenite was mined by American Cyanamid, Piney River, Va.; Du Pont, Starke, Fla.; Florida Ore Processing Co., Melbourne, Fla.; National Lead Co., Tahawus, N. Y.; and Rutile Mining Co. of Florida, Jacksonville, Fla. Ilmenite was recovered from monazite sands by Baumhoff-Marshall, Inc., Idaho-Canadian Dredging Co., and Warren Dredging Co., all at Boise, Idaho.

Du Pont announced plans in September 1953 for construction of a $3-million mine and processing plant for production of titanium minerals to be built and operated near Lawtey, Fla. by Humphreys Gold Corp.

Imports of ilmenite concentrates for January to September 1953, inclusive were 209,269 short tons, an increase of 40,075 tons for the same period in 1952. India supplied 137,000 tons, and Canada 71,815 tons. Titanium slag shipments from Quebec Iron and Titanium Corp., Sorel, Que. totaled about 145,000 short tons, 70% TiO_2 in 1953.

Prices. Ilmenite concentrates containing 59.5% TiO_2, nominal, f.o.b. Atlantic Ports, were $18 to $20 throughout 1953. Nominal quotations for rutile, minimum 94% concentrates were 7 to 8½c per lb in January 1953. They declined to 5 to 6c in June, where they remained until the year's end.

Imports of rutile concentrates from Australia were reported at 13,118 short tons in the first nine months of 1953. Rutile is chiefly used to make welding rod coatings, with lesser amounts for titanium metal, alloys and carbides, ceramics and fiber glass•

Aluminum Production of World

Thousands of tons	1952	1953
United States	937	1,252
Canada	496	539
Western Europe	459	480
Asia & S. America	56	61
Free World Total	1,948	2,332
USSR & Satellites	307	354
World Total	2,255	2,686

Aluminum Supply in the U. S.

Thousands of tons	1952	1953
Domestic production	937	1,252
Imports	128	290
Total Primary	1,065	1,542
Secondary	222	250
Total New Supply	1,287	1,792

Aluminum

- **Production increased by 33%**
- **Old markets grew and new markets arose**
- **For 1954 — Aluminum is ready to meet the selling challenge**

IRVING LIPKOWITZ
Assistant to the President
Reynolds Metals Co.

REVIEW

AN ALL-TIME RECORD for primary aluminum production was set in 1953 by domestic producers. Output of 1,252,015 tons was 33% higher than the previous record of 937,331 tons set in 1952.

In the past five years primary production has increased 628,559 tons, more than doubling the 1948 output. Over 90% of this increase required construction of new capacity, the bulk of it having been built after the outbreak of the Korean War. In 1950, with all facilities operating at capacity, primary production in the U. S. totaled 718,500 tons. During the past three years domestic producers (Alcoa, Reynolds Metals and Kaiser Aluminum) invested close to $800-million in new facilities, most of it to increase their productive capacity. As a consequence, by 1953 the domestic industry achieved a 74% increase in primary production over the capacity output of 1950.

U. S. production increase of 314,684 tons during 1953 was almost 3 times as large as the 113,000 ton increase realized by all of the other aluminum producing countries in the world combined. As a result, U. S. primary production accounted for 46% of the world's total during 1953. The U. S. alone produced more than 3½ times as much as is reported for all of the Iron Curtain countries.

Bauxite operations have also stepped up to provide the necessary ore. Domestic mine production, over 95% of it in Arkansas, declined slightly with the estimated output under 1,600,000 tons, compared with the 1,667,000 tons in 1952. Imports, however, showed a 26% increase, rising from 3.5-million tons in 1952 to an estimated 4.4-million tons. The proportion of imported ore to domestic has risen each year from 61% in 1947 to 72% in 1953.

Surinam continued to be the principal source of imports, with 1953 shipments exceeding 1952, when over 3-million tons were brought into the U. S. Increase in supply came principally from Jamaica, with shipments exceeding 1-million tons, against 265,000 tons in 1952. Bauxite also came in from British Guiana and, for the first time since 1939, from Greece.

Foreign aluminum, in primary and fabricated form, was available in the U. S. market in larger quantities than in any other peacetime year. Department of Commerce estimated that it would amount to 290,000 tons, about 162,000 tons more than in 1952. This increased influx of foreign metal came about primarily because the decline in Western Europe's demand, begun in 1952, continued through 1953. At the same time, the regular sources of supply for these markets, the Canadian and Western European producers, stepped up their primary output 69,000 tons.

With the growth of its aluminum industry and the softening of its home markets, Western Europe played a more prominent role as an exporter to the U. S. During recent years over 90% of the incoming ingot came from Canada, but in 1953 the percentage dropped to 75%. Correspondingly, Western Europe's share increased from 4% in 1952 to 25% in 1953.

Supply of secondary aluminum, recovered from scrap, reflected the industry's general growth. According to estimates of Aluminum Smelters Research Institute, 1953 production of secondary aluminum amounted to 250,000 tons, a 12% gain.

Total supply was 39% greater than in 1952, making aluminum plentiful for all uses during 1953. At the beginning of January 1953 producers' stocks, as reported by the Bureau of Mines, totaled 7,274 tons. By the end of October they stood at 21,790 tons.

Aluminum shipments also set an all-time record with a total of over 1,750,000 tons, 34% above the previous record of 1,330,000 tons, in 1952. With a much larger supply available, the industry was able to provide more aluminum for civilian products than ever before even though defense shipments were higher than in any other year since the start of the Korean War.

Availability of sufficient aluminum to meet all needs during 1953 made it possible for the Government to remove Korean emergency controls and restrictions on distribution and use of aluminum and aluminum products. The CMP system of allocations and controls was terminated as of July 1, 1953, and the simpler Defense Materials System was substituted. An aluminum "set aside" is created under this arrangement whereby sufficient quantities of aluminum are earmarked each quarter to meet all military and atomic energy requirements. Except for military stockpile requirements, the remaining supply has been available to meet civilian demand.

MARKETS GROW

Ready availability of aluminum for civilian use, without restrictions, brought increased emphasis by the industry on market development and new applications. Manufacturers of civilian products also showed renewed interest in the possibilities of aluminum, once it became evident that supplies would be adequate.

Aluminum panels for curtain wall construction of office and industrial buildings was one of the major developments. Advantages offered by aluminum were strikingly demonstrated when aluminum panels were used in construction of a 26 story office building in New York City. Three crews of five men each walled in the entire building with these panels in six and a half working days. Aluminum exteriors are being used in the construction of 70 other large buildings in various parts of the nation. About 275,000 tons of aluminum were used for construction and building during 1953, almost 40% more than in 1952.

The automotive market for aluminum also made significant progress with all major manufacturers using more. As against a previous average of less than 10 lb per car, models contain over 50 lb each. The newest model military jeep, designed for airborne operations, is 1200 lb, or 45%, lighter than previous models. Much of the weight saving is accomplished by using an all-aluminum body weighing 81 lb and other aluminum components. The trend towards the extensive use of aluminum for the bodies and engines of trucks, trailers and buses continued during the year, with some models of trucks using over 200 lb per unit and close to 3,000 lb going into some current models of buses.

The automotive industry's strong interest in using aluminum was symbolized with the start of production by General Motors at its new casting plant in Arkansas, located adjacent to a major primary aluminum producing plant. Hot primary metal in molten form is delivered from its electrolytic cells to the casting plant. This integration of aluminum production and the casting of auto parts cuts processing, transportation and inventory costs.

Electrical markets expanded during 1953 with the wide acceptance of aluminum for many electrical wire and accessory applications. The covered wire market, virtually non-existent five years ago, consumed substantial tonnages. Aluminum became the standard material for the bases of household electrical bulbs as the largest manufacturers completed the conversion of their production lines.

The favorable price of aluminum compared to copper continued to be an important influence in the electrical market. One large equipment manufacturer announced during the year that a 10% cut on its line of reactors was "made possible through the use of aluminum instead of copper conductors."

As sheathing for power cables, a major manufacturer began to use aluminum instead of lead. This application, though well established in Europe, is just getting on a production basis here. It has been estimated that aluminum sheathing for power cables would be less than one-third as costly as lead and even more economical when used for telephone cables.

Consumption of aluminum for packaging increased rapidly, especially since foil was the first aluminum product to be freed of Government restrictions on its civilian use. The household foil market, developed since World War II, continued to grow.

The "do-it-yourself" trend provided another market. Various types of aluminum products, such as sheet, tubing, and extrusions, as well as fastening accessories—suitable for home workshop use—became available towards the end of the year. A notable feature of these is the fact that they do not require special tools. Regular woodworking tools can be used.

IMPORTS CONTROVERSY

With aluminum markets soft in Europe, total imports to the U. S. of semi-fabricated aluminum during the past year probably amount to 35,000 tons, about three times as much as the average yearly imports in the previous 5 years.

A controversy developed over the application of the Buy American Act to semi-fabricated aluminum as a result of bids on Government contracts by importers of such products. The Aluminum Association filed a statement with the Defense Department on behalf of domestic fabricators, protesting exemption of foreign semi-fabricated aluminum from the Buy American Act. The Defense Department ruled that foreign semi-fabricated aluminum products were not exempt and that bids offering such products should be considered according to the procedures set forth in a Defense Department directive of June 1952. That directive, applying to all types of foreign products and materials, requires that various strategic and domestic economic considerations be taken into account before determining whether or not the foreign product should be purchased pursuant to the objectives of the Mutual Security Program in appraising bids from suppliers of foreign products, the directive requires that each bid be considered by the Defense Department, "case by case" at the secretarial level.

FORECAST

Primary aluminum production is expected to rise still higher in 1954. The nation's fourth producer, Anaconda Aluminum Co., plans to bring its first plant into production. Present indications are that

(Continued on page 136)

Magnesium

- **Consumption over 50,000 tons**
- **More mill products from a modern plant**
- **Progress in printing plates**

DR. J. D. HANAWALT,
Vice President and Manager
Magnesium Div., Dow Chemical Co.

IN 1953, NATIONAL CONSUMPTION of magnesium slightly exceeded the 1952 consumption of 50,000 tons. Elsewhere in the world, magnesium production was carried out primarily in Norway and Canada, with the largest consumption outside the U. S. being in England and Germany where the industry is well established. Probable foreign consumption, which would equal production, amounted to about 15,000 tons.

Almost one-third of the domestic consumption of magnesium was by the aircraft industry and another 20% was used as an agent in aluminum alloys and the chemical industry. Other large fields of application were in machinery and tools, cathodic protection, ground transportation, materials handling, and consumer articles.

KEY DEVELOPMENTS

Sheet in commercial quantities will become available for the first time in the history of the magnesium industry, from the modern rolling mill which began operation in 1953 at the Madison Division of The Dow Chemical Co. Sheet stock will be available from four-high coil mills ranging in size from 36 in. to 84 in. In 1953, operation of the Madison mill was confined to the 84-in. four-high reversing hot mill, which serves for the breakdown of 1-ton rolling ingots. Ingots are brought down ready for coiling in approximately 3 min, a sharp contrast with all previous practice in which slabs of 100 lb were broken down in hand mills.

Early in 1954 the four-high cold and finishing mills at Madison will be brought into production. Improved rolling techniques should give higher and more uniform properties and better finishes.

Extrusion presses at the Madison plant in sizes from 1700-tons to 5500-tons, and including by 1955 a 13,200-ton press, will produce a range of shapes and sizes heretofore unavailable.

This $50-million-plus facility, gives the industry a highly integrated mill products plant, and presages the real beginning of a commercial mill products industry for magnesium, which has been primarily a casting industry.

Printing plate progress was another major development in 1953, with the successful commercial application of a new chemical method whereby high quality magnesium printing plates could be made much faster and more economically than by conventional practices. These plates are useable for direct printing on paper or for the preparation of duplicate printing plates.

Essentially, the new process consists of application of a unique etching solution to a magnesium alloy plate in a specially-designed machine. Plates prepared by the Dow process are etched cleanly to printing depth in from one-fifth to one-tenth the time required by present means. Printers engaged in the test program indicate that the quality of the etch sets a new standard for the printing industry.

Complementing newly available, high speed photographic typesetting, this development offers printers a rapid, economical means of converting an image on photographic film to a quality magnesium printing plate.

Magnesium photoengraving plates have been available to printers for eight years and are now used by 25% of the commercial and newspaper engravers in the United States and Canada. New process should broaden their use.

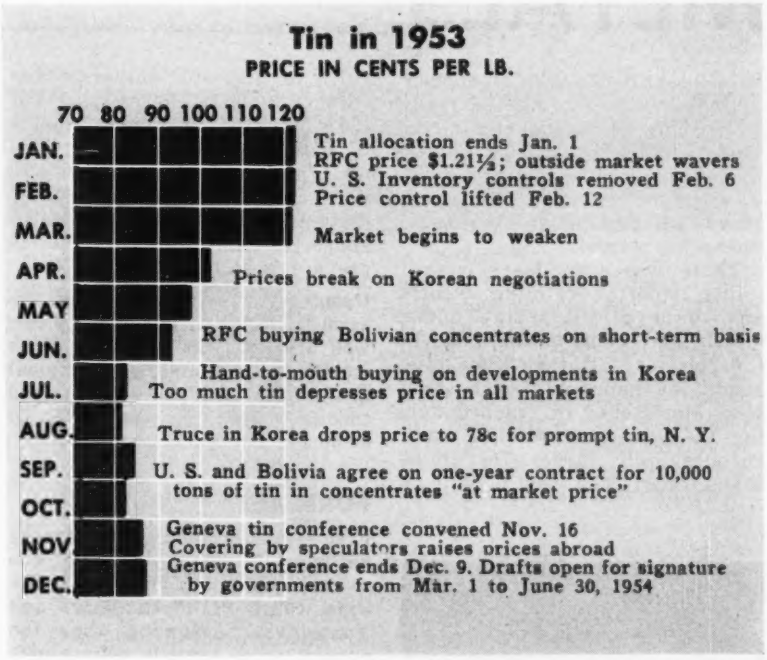
Two new anodic coatings, HAE which was developed by Frankford Arsenal and the Dow #17 Anodyze, provide better corrosion resistance, better paint bases and better abrasion resistance than any previous coatings. Coupled with these discoveries are new and improved methods of insulating magnesium from dissimilar metals and new paints and primers, all of which are broadening usage.

Magnesium electroplating, which was a technical development of a few years ago, has reached the production stage. At present, one of the production plating jobs is being run at the rate of 14,000 pieces a day in a commercial shop. This electroplating development in magnesium promises to attain, in practical production, a comparable status with other common metals in appearance, service, and cost.

In the casting field, the development of new magnesium alloys containing thorium which provides good creep resistance at temperatures in excess in 500 deg. F. has increased the useable range of magnesium sand castings in the jet engine field.

In the aircraft field, approximately 95% of the wheels are made of magnesium. Magnesium wheels are equally good in ground transportation, and truck and trailer manufacturers are showing increased interest. Sparked by the successful use of sand cast magnesium wheels in the Indianapolis Speedway Race, where they are almost a standard—(used on 30 cars in a starting field of 33)—an application of magnesium wheels on automobiles is a definite possibility in the future.

Automotive use of die castings is continuing on an increasing scale. In the field of business machines, portable tools, textile and printing machinery, the light weight, economies of production, and ruggedness of magnesium die castings are key factors in their large usage.


Tin in 1953
PRICE IN CENTS PER LB.
70 80 90 100 110 120
JAN.
FEB.
MAR.
APR.
MAY
JUN.
JUL.
AUG.
SEP.
OCT.
NOV
DEC.
Tin allocation ends Jan. 1
RFC price $1.21½; outside market wavers
U. S. Inventory controls removed Feb. 6
Price control lifted Feb. 12
Market begins to weaken
Prices break on Korean negotiations
RFC buying Bolivian concentrates on short-term basis
Hand-to-mouth buying on developments in Korea
Too much tin depresses price in all markets
Truce in Korea drops price to 78c for prompt tin, N. Y.
U. S. and Bolivia agree on one-year contract for 10,000 tons of tin in concentrates "at market price"
Geneva tin conference convened Nov. 16
Covering by speculators raises prices abroad
Geneva conference ends Dec. 9. Drafts open for signature by governments from Mar. 1 to June 30, 1954

Tin Statistics

Long Tons	Estimated 1952	1953
World mine output	171,000	170,000
World consumption	130,000	135,000
U. S. consumption	45,323	54,000
U. S. imports:		
As pig tin	80,543	75,000
Contained in ore	26,491	34,000
	107,034	109,000
Production, Longhorn smelter in Texas	22,541	37,651
Average price N. Y.	120.473c	95.845c

Tin

- **Sharp drop in price revives drive for international control**
- **U. S. stockpile needs filled**
- **Surplus points to general cut in output for '54**

H. H. WANDERS
Market Editor

PRICEWISE, THE TIN MARKET in 1953 had a great fall. It was a painful operation and proved once again that excesses of the past, regardless of the cause, have to be paid for in the hard way. Forces brought into play by an imbalance in supply and demand eventually exact their toll.

The violent decline in the price of "Straits" quality tin—from a high of $1.21½ a pound to the low of 78c—generated a strong movement among producers for another try at a scheme to stabilize the price and restore a profitable basis for development of the industry.

Though controls on use and other restrictions were dropped by the U.S. early in the year, because the supply was clearly in excess of the foreseeable needs of industry, the gains registered in actual use of tin for commercial purposes were offset by continued uncertainty over the stockpiling program. Early in the year the Reconstruction Finance Corp. was a seller of tin to consumers at the top price for the year, which was, in effect, a ceiling price. As freer offerings from outside sources increased, the pressure on the price structure became pronounced. The downward trend of the market was accelerated by developments in the Far East, notably in Korea, that pointed toward a truce and a general easing in the tension in the world's most important tin producing areas. It will be recalled that political tension was an important factor in booming prices in 1951 and 1952.

U. S. imports were far in excess of consumption, but substantial tonnages continued to move into the stockpile, mostly against contracts made previously. The strategic reserve as the year ended was estimated in market circles at between 180,000 and 200,000 long tons.

The RFC resumed its purchases of tin concentrates from Bolivia, and won out in its stand that contracts must be closed on the basis of the market price. One such deal, involving 10,000 tons, and extending to March 1954, was closed "to help Bolivia."

Williams, Harvey & Co., operating a smelter near Liverpool, entered into a deal to acquire the production of the mines of the nationalized Patino group, in Bolivia. This agreement extends to the end of 1955, and settlement is to be based on the London market.

Despite the falling prices, production statistics continued to point to a heavy oversupply. The truce in Korea, announced July 27, caused London and Singapore markets to weaken further and the price in New York dropped to its low for the year.

(*Continued on page 136*)

MINOR METALS

CHARLES WHITE MERRILL
Assistant Chief,
Minerals Division,
Bureau of Mines

BY THE END OF 1953 emergency controls over the minor metals had largely ended, and continuing Government stimulation of supply was almost entirely in the form of long-term contracts which had been negotiated during the Korean emergency period.

There was a tendency toward rising imports, declining exports and lower prices. Where minor metals were being accumulated in the National Strategic Stockpile, conditions improved; some goals were approached or reached during the year, and receipts were encouragingly larger for items that formerly had been lagging. •

Antimony

ABBOTT RENICK
Commodity Industry Analyst
Bureau of Mines

IN 1953 U.S. SELF-SUFFICIENCY in primary antimony declined to less than 1%, based on shipments, as a consequence of almost complete suspension of domestic mine production under the impact of foreign imports. With a 50% decrease in other countries, mine production in the Free World totalled 25,000 short tons.

Supply: In addition to general U.S. imports noted on accompanying table, about 2,500 tons of antimony in domestic and foreign lead-silver ores was recovered, compared with 2,800 tons in 1952. Imports of ore and concentrates came principally from Bolivia, Mexico, Peru and Chile. Imports of metal were chiefly from Mexico, Belgium-Luxembourg and Yugoslavia. The bulk of the imported antimony oxide came from the United Kingdom and Belgium-Luxembourg.

Smelter production in the U. S. was estimated at 7,500 tons against 11,900 tons in 1952.

Industrial consumption of primary antimony was expected to be about 13,000 short tons. It was estimated that use in manufacture of metal products increased about 45% compared with the previous year, whereas use in nonmetal products decreased about 25%.

Price of domestic antimony was reduced by 6c per lb to 28.50c for RMM brand, f.o.b. Laredo, carlots in bulk, effective Nov. 26. This was the first change in the domestic price since Nov. 3, 1952. Reduced domestic prices were still above foreign brand quotations prevailing at the end of 1953.

Demand for antimony ore, in the form of Bolivian chemical grade, was firm in 1953. The New York market price of Bolivian chemical grade antimony ore remained through the year at $3.40 to $3.60 per short ton unit.

FORECAST

Free World production of primary antimony in future will continue to come chiefly from Mexico, Bolivia, Union of South Africa and Yugoslavia. Assuming that the present price level is maintained, the Free World should produce 25,000 tons in 1954 as it did in 1953.

China threat. From 1913 to 1937 Hunan Province of China produced almost two-thirds of the world supply of antimony. It is believed that Chinese antimony production could be economically maintained almost indefinitely at more than double its current level of about 9,000 short tons a year. At present, this potential serves mainly as a threat to Free World producers, deterring long-term investment in the industry.

Research. The Bradley Mining Co. is sponsoring research at Battelle Memorial Institute on antimony electroplating and antimony-aluminum resistor alloys. Other private companies likewise are conducting research in these fields. •

Antimony in the United States

Short tons	1952	Estimated 1953
Domestic mine production	2,200	100
Imports for consumption	12,800	11,800
Exports	160	10
Consumption of primary antimony	14,300	13,000
Average price of PMM brand, antimony metal, in bulk, 99½%, f.o.b., Laredo, ¢ per lb.	42.09	33.95

Beryllium

ROBERT F. GRIFFITH
Commodity-Industry Analyst
Bureau of Mines

BERYLLIUM, in 1953, underwent a change in supply-demand pattern similar to many other small-tonnage "defense" metals; an ample supply was available, and primary producers were actively engaged in developing new uses and in seeking new markets. The supply of beryl, the only commercial source-mineral of beryllium, was by far the greatest in history in 1953, and resumption of commercial production of beryllium metal, master alloys, and compounds by Brush Beryllium Co. in a new plant at Elmore, Ohio, resulted in an assured supply of basic material to fabricators and producers of end-use products.

In the past, lack of an assured supply has made it difficult for the beryllium industry to develop a steady, commercial market. During times of emergency beryllium is used primarily for defense and commercial users are forced to find substitutes. When defense demands decrease, time is required for readjustment to commercial application. Thus, manufacturers of end-use products have been reluctant to gear their industry to beryllium.

U. S. consumption of beryl remained at about the same level; the difference between new supply and total consumption went largely to the National Stockpile in the form of beryl ore. Beryllium-copper master alloy, a more immediately usable material, has not been stockpiled.

Although preliminary data indicate a record-high production of domestic beryl in 1953, over 90% of the new supply was obtained abroad.

Brazil was the largest source, supplying 34% of United States imports. Beryllium Corp., Reading, Pa., played an important part in increased beryl production from Brazil by participating in a program to evaluate reserves and mechanize mining methods. Main sources of U. S. supply were: Argentina, 23%; Southern Rhodesia, 16%; South Africa, 13%. Others were Mozambique, Portugal, India, and Madagascar.

There is little assurance that imports of beryl will continue to increase or even remain at the same level. For example, in South Africa known reserves of cobbable beryl are fast becoming depleted, and imports from Argentina during 1953 were believed to be largely from accumulated stocks.

Record-high prices established in 1952 were maintained throughout most of 1953. Toward the year end, however, a slight decrease was noted, and Government contracts were being negotiated at a slightly lower figure. The Government's program for purchases of beryl from small domestic producers was extended from June 30, 1953 to June 30, 1957. Under this program, beryl is accepted for the National Stockpile at purchase depots at Custer, S. Dak., Franklin, N. H., and Spruce Pine, N. C., at prices ranging from $40 to $50 per short-ton unit BeO for beryl containing from 8 to over 10% BeO.

High prices have not greatly increased domestic production. Mechanical beneficiation processes must be developed if U. S. dependence on foreign sources is to be reduced.

A flotation process developed by the Bureau of Mines, on a laboratory scale, at Rapid City, So. Dak. was tested on a pilot-plant scale in 1953. These experiments are still in the development stage and a successful commercial process has not yet been perfected. Beryl is still recovered entirely by hand-sorting methods.

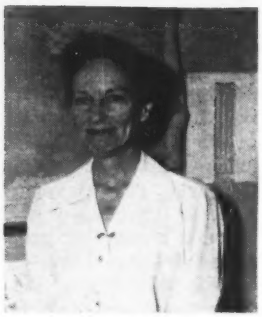
Export restrictions on beryllium-copper master alloy were relaxed, the Department of Commerce announced Nov. 19, 1953. No quantitative limit is set on exports but they are still controlled to safeguard national security.

Beryllium-copper alloys are unsurpassed in their ability to withstand fatigue and wear and at the same time conduct electrical current under high temperature conditions. Furthermore, they can be worked in a relatively soft state and then brought to their final level of strength and hardness by simple low-temperature heat treatment. In view of improved supply, it is certain that many new and useful applications of beryllium products will be forthcoming as industry becomes more generally aware of their superior properties. •

Beryl Statistics

Short tons	1952	Preliminary 1953
World production	7,200	9,000
Domestic production (mine shipments)	515	750
United States imports	5,978	8,500
Total new supply	6,493	9,250
Commercial consumption	2,477	3,300
Average price per short ton unit BeO (10-12 percent BeO)	$38.55	$47.00

Mercury



HELENA M. MEYER
Assistant Chief, Base Metals Branch
Bureau of Mines

Mercury Statistics

Flasks of 76 pounds	1952	1953
Production	12,547	14,300[b]
Imports[a] (general)	61,012	57,779
Exports[a]	361	274
Average price, New York	$199.10	$193.03

[a]—Ten months.
[b]—Estimated.

A HIGH RATE OF IMPORTS exceeded by only two or three earlier years in the history of the industry, moderately higher domestic production and industrial consumption, and a falling price featured the mercury industry in 1953.

General imports for 10 months were 57,779 flasks. Government barter contracts, using surplus commodities, contributed substantially to the large movement of metal to the U. S. Spain supplied 38%, Italy 36%, Mexico 18%, and Yugoslavia 8%.

Industrial consumption should be 10% over 1952. Two new chlorine and caustic soda plants using mercury cells were opened at Anniston, Ala., and Culvert City, Ky. Capacity was expanded at Syracuse, N. Y. An old plant of the same type at Jersey City, N. J. was closed and the mercury returned to use. Another plant, completed but not put into operation in 1952, continued idle in 1953. Otherwise increases in agricultural and pharmaceutical uses were offset by a drop in consumption for industrial and control instruments. Reports indicate that mercury was used in one of four experiments conducted to appraise the prospect for private participation in joint production of electric energy and fissionable material.

Producers failed to expand output despite the highest 3-year price level of all times. Production advanced 14% over 1952, but was only 33% of the average rate in 1941-45.

Several mercury properties held DMEA contracts and at one property, at least, substantial new reserves were developed.

Price quotations ranged from $217 to $219 a flask at the beginning of the year, but dropped with only one interruption until they were $183 to $185 in mid-October, lowest since January 1951. Shortage of spot metal was credited in reversing the downtrend, and $186 to $188 was quoted in mid-December. Knowledge that world producers could readily supply foreseeable demand, for the short term at least, was an important factor in the weakening of prices.

Stocks of 33,402 flasks of mercury in producers, consumers, and dealers hands on Sept. 30 were, with one or two exceptions, well above other periods prior to the last quarter of 1952. These inventories continued considerably above normal owing to the large quantity held at the idle chlorine plant. They do not include large quantities held by the U. S. Government.

New Plant, large and modern for treating mercury ores, at the Almaden mine, Spain, was completed in 1953. What Spain's annual production rate is likely to be with the new equipment is not known.

FORECAST

Consumption in the near future may not hold at recent high annual levels unless some new use is developed. If it does not, prices likely will drop further and domestic production likewise will fall. Mercury's far future probably will follow the level of industrial activity with possibilities for expansion greater than the average if amalgam metallurgy or something else as important is advanced. •

Arsenic

Arsenic Trioxide in the United States

(Short tons)	1952	Estimated 1953
Production	15,700	12,000
Imports	4,500	4,700
Apparent consumption	13,700	13,500
Average price per pound	6c	5½c

ABBOTT RENICK
Commodity Industry Analyst
Bureau of Mines

DOMESTIC PRODUCTION of both crude and refined arsenic (arsenic trioxide in 1953 was expected to fall to 12,000 tons or considerably below the 15,700 short tons produced in 1952. The trend in consumer preference for organic chemicals over arsenicals was expected to continue, further decreasing the demand for arsenic.

Imports of metal and arsenic trioxide totaled 3,500 short tons for the first nine months of 1952

(50 tons and 3,450 tons, respectively) and were estimated at 4,700 tons for the year, an increase of 4% over 1952. Sweden was the principal supplier of the metallic arsenic, while Mexico continued to be the leading supplier of arsenic trioxide.

The market price of arsenic remained throughout the year at 5½c per lb, unchanged since June 16, 1952. •

Bismuth

Bismuth Statistics

Pounds	1952	Estimated 1953
Consumption	1,775,000	1,615,000
Imports	708,000	623,000
Exports	245,000	96,000
Average New York price per pound, in ton lots	$2.25	

ABBOTT RENICK
Commodity Industry Analyst

IN 1953 DOMESTIC REFINERY PRODUCTION of bismuth was expected to be 1,615,000 lb, virtually unchanged from 1952. Based on data for the first 9 months, total imports of refined metallic bismuth for the year were about 12% lower. The approximate distribution by countries of origin was: Peru 78%, Yugoslavia 8%, Korea 7%, and others 7%. The major output of bismuth in Mexico was imported as bismuth-lead bars for refining in the United States. Exports of metal and alloys were expected to drop about 68% under 1952. The United Kingdom was again the principal recipient.

Demand for bismuth, particularly in the form of refined metal, should be about 5% under the 1952 consumption based on data on the first 9 months. Its use in pharmaceuticals was the lowest on record, reflecting the continuing trend toward the antibiotics and kaolin-base preparations that have replaced bismuth compounds to some extent since World War II.

New York market price remained at $2.25 per pound in ton lots.

Immediate outlook is for the world output of bismuth to continue at about the 1953 level, namely 3.9- to 4.0-million pounds. The short term outlook is for somewhat increased world production due to the recent expansion of production in Korea and Yugoslavia. •

Cadmium

ROBERT L. MENTCH
Commodity Industry Analyst
Bureau of Mines

Cadmium Statistics

Pounds	1952	1953
Production (metal)	8,450,000	9,600,000[1]
Imports (metal)	1,479,000	1,366,000[2]
Exports	301,000	56,000[2]
Apparent consumption	9,042,000	9,900,000[1]
Average price, commercial sticks, New York	$2.32	$2.00

[1]Estimated. [2]10 months.

MOST SIGNIFICANT DEVELOPMENT in cadmium in 1953 was expansion of many segments of the industry. Records were established in total supply, production, imports, consumption, and stocks. Total supply was approximately 11,200,000 lb or over 1-million lb greater than the former high in 1952. Apparent consumption of primary cadmium advanced to approximately 9,900,000 lb or 9% above the total in 1952. Industrial consumption increased much more than figures for apparent consumption indicate, since Government purchases for the National Stockpile were substantially lower than in 1952.

Paradoxically, stocks also increased to record levels; metal producers', compound manufacturers', and distributors' inventories totaled about 3-million lb on Dec. 31 compared with 1,867,000 lb in 1952. Metal producers' stocks increased about 1,200,000 lb, owing largely to competition from imports.

U. S. output increased to an estimated 9,600,000 lb, 14% above the 1952 total and topping the 9,206,097 lb in 1950. Production was preponderantly from primary sources as a byproduct of zinc, with only a little secondary metal recovered. U. S. production is not wholly from domestic materials; a large portion is obtained from foreign materials, notably imports of cadmium-bearing flue dust, and zinc and lead ores and concentrates.

In 1953, owing to unusually heavy imports of zinc concentrates, probably more than half of the cadmium metal produced at domestic plants was of foreign origin. Mexico was the chief foreign source of cadmium-containing raw materials, followed by

Canada, Peru, and South-West Africa.

Imports of metallic cadmium increased to an estimated 1,600,000 lb, a gain of 8% over the record quantity in 1952. Imports of cadmium-bearing flue dust were approximately 2-million lb cadmium content or essentially the same as in 1952. Mexico supplied 96%.

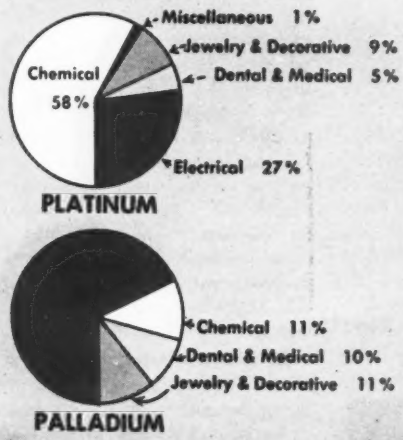
Exports of metallic cadmium from the United States decreased 78% to about 65,000 lb. Shipments to West Germany constituted 42% of the total and Canada received 38.5%.

The quoted New York price of $2.00 a lb for commercial sticks of cadmium, established Aug. 1, 1952, remained unchanged. One domestic producer opened the year at $1.75 a lb, but returned to the $2.00 basis in January.

(*Continued on page 133*)

Platinum Group Metals in the U. S.

CONSUMPTION



(Troy ounces)	1952	1953
First 9 months of year		
PLATINUM		
Imported and domestic refined	192,000	269,000
Domestic sales plus exports	159,000*	180,000*
Price	$90-$93	$90-$95
PALLADIUM		
Imported and domestic refined	175,000	204,000
Domestic sales plus exports	153,000	166,000
Price	$24	$22-$24
PLATINUM GROUP		
Domestic sales	14,000	17,000
Iridium price	$175-$200	$170-$200
Osmium price	$200-$210	$140-$200
Rhodium price	$125	$125
Ruthenium price	$93	$75-$93

*Does not include Government purchases for stockpile.

Platinum Group

JAMES E. BELL
Commodity-Industry Analyst
Bureau of Mines

WORLD PRODUCTION of platinum group metals in 1953 is estimated at 725,000 oz troy. Output of producing countries was estimated as follows: Canada, 290,000 oz troy; Union of So. Africa, 253,750; USSR, 108,750; Colombia, 36,250; U. S., 36,250.

Total production consisted of about 60% platinum, 30% palladium, and about 10% iridium, osmium, rhodium, and ruthenium together.

Domestic demand for platinum-group metals continued strong, with 9 months' data indicating that total sales of the 6 metals together were about 13% greater than in 1952.

Demand for platinum for jewelry manufacture was below expectations, but this lack was more than offset by the continuing expansion of the use of platinum as a catalyst in the petroleum industry. Construction was started on a $2,500,000 plant in Newark, N. J., to produce a new platinum-containing catalyst for use in reforming petroleum developed jointly by the Sinclair Oil Corp. and Baker & Co., Inc.

Features of the platinum industry in 1953 were the revocation in February of the ceiling price of $93 per oz. established by OPS in April 1952, and cancellation in May of NPA Order M-54 that prohibited sale or purchase of platinum for investment or for jewelry or other decorative uses (finished parts in inventory excepted).

Platinum was purchased by the government for stockpiling, but this metal is not included in accompanying table. Stocks of platinum of refiners and dealers increased moderately during the first 9 months.

Iridium, osmium, rhodium, and ruthenium are used mainly in alloying platinum or palladium. The largest user in 1953 was the chemical industry, which accounted for 39% of the total consumed•

FERROALLOY METALS

Ferroalloys Produced and Shipped From Furnaces in the U. S.

	1952			1953 (estimate)		
	Production	Shipments		Production	Shipments	
	Short tons	Short tons	Value	Short tons	Short tons	Value
Ferromanganese	758,721	738,088	$133,996,006	900,000	875,000	$205,000,000
Spiegeleisen, Silicomanganese, Manganese briquets	176,628	177,074	26,586,156	180,000	155,000	
Chromium alloys	248,421	242,572	88,937,103	290,000	255,000	100,000,000
Silicon alloys	781,888	760,981	84,095,168	870,000	850,000	95,000,000
Ferrotungsten, Ferromolybdenum, Other molybdenum products	33,372	33,366	52,019,126	110,000	95,000	70,000,000
Other ferroalloys	83,669	86,385	23,225,409			
Total	2,082,699	2,038,466	$408,858,968	2,350,000	2,230,000	$470,000,000

NORWOOD B. MELCHER, Chief
Ferrous Metals and Alloys Branch
Bureau of Mines

HIGH LEVEL OF REQUIREMENTS and expansion of capacity for emergency needs, resulted in an all-time high in production, shipments, and value of ferroalloys in 1953. As would be expected, the largest increases in requirements were in alloys needed for steel, particularly manganese and silicon alloys. Noticeable in several alloys was the larger growth in production than in use, which resulted in higher inventories.

Ferroalloys are among products in highest demand during emergency periods, and since Korea, a considerable expansion in ferroalloying facilities has been authorized. Completion of many of these late in 1953 came at a time of easing market demands, and resulted in some temporary overcapacity.

National Production Authority Order M-80, which controlled the distribution and use of 14 ferroalloying metals and ferro-alloy products, was revoked on Nov. 1, 1953. Last of the metals controlled under this order was nickel. Demands for nickel remained high following termination and displacement of some nickel substitutes reinstituted new demands. Stainless steel of the austenitic type had been using manganese as a substitute for nickel but manganese additions were more costly, and producers of stainless steel were quick to reenter the nickel market. This switch, and other reductions in manganese needs, immediately hit the market for electrolytic manganese whose greatly expanded capacity posed a new problem.

The year-end outlook for ferroalloy metals was for expanding availability of all metal but lower demands, except for nickel and cobalt. Consumers will become more discriminating as to grade of material. Demands for pure metals, as contrasted to ferroalloys, will increase as needs for high-temperature and other special alloys increase. The overall volume of the ferroalloy industry will continue to follow the trend of steel production•

Tungsten

ROBERT W. GEEHAN
Assistant Chief
Ferrous Metals and Alloys Branch

TRANSITION FROM SHORTAGE to abundance was the keynote of the tungsten industry in 1953. All controls on distribution and use were removed; domestic production increased 20%; world prices declined 60%.

Domestic production was obtained from many scattered operations in 11 states and Alaska, led by California, Colorado, Idaho, Nevada, and North Carolina. Increased production largely resulted from development and plant expansion completed in 1952. As much less work was underway in 1953, the production rate probably will not similarly increase in 1954.

Congress extended the termination date of the Domestic Tungsten Program to July 1, 1958, or until 3-million units are purchased, whichever occurs first.

Tungsten Ore and Concentrates in the U. S.

Thousands of pounds	1952	Estimated 1953
Production	7,233	8,700
Consumption	8,634	8,000
General imports	16,985	29,000
Exports	11	....
Industry stocks, end of period	3,025	4,119[1]

[1] September 30, 1953.

This extension may encourage further expansion of production capacity. By November 1953, 391,465 short-ton units had been delivered. If production is maintained at the 1953 rate and is all delivered to the Government, slightly less than the authorized quantity will have been received on the termination date of the program. Any substantial increase in production will mean delivery of the full amount and termination at an earlier date.

Two most productive domestic mines were both being developed by 1500-ft. shafts. At the Hamme mine, North Carolina, the Central and Sneed shafts were being sunk to the 1500-ft. level. At the Pine Creek mine, California, a 1500-ft. raise to connect two adit levels, was nearing completion. Deepest operating level at the Hamme mine is the 700-ft. Highest stoping from the Pine Creek raise is about 800 ft above the sill.

Nearly 8% of domestic concentrates came from custom mills. Some low-grade concentrates were upgraded on a custom basis. The Pine Creek mill of United States Vanadium Co., The Getchell mill of Getchell Mine, Inc., the Nevada Scheelite mill of Kennametal, Inc., the Marion mill of Boulder Tungsten Mines, Inc., and the Wolf Tongue mill of Hetzer Mines, Inc., were the most active. A chemical plant designed to convert low-grade tungsten concentrates to high-grade synthetic scheelite was completed in Salt Lake City by Salt Lake Tungsten Co.

Preliminary estimates of world production during 1953 indicate a substantial increase for Brazil, Canada, Korea, Spain, and Thailand. Total output (excepting China, North Korea, and Russia) increased from 34,000 metric tons of 60% WO_3 content in 1952 to 42,000 in 1953. Production in 1954 can be expected to decline because of lower prices; however, many of the larger mines have contracts that call for prices above present open-market quotations.

General Imports (receipts) of tungsten ores and concentrates into the U.S. during the first 10 months were 24,470 lb metal content, largest quantity since records have been kept. In 1952 16,985,000 pounds was received. Republic of Korea (5,101,000), Bolivia (2,652,000), Spain (2,606,000), Portugal (2,585,000), Brazil (2,102,000), Thailand (1,760,000), Burma (1,476,000), and Canada (1,437,000) supplied 81% of the total for the first 10 months.

Imports of ore and concentrates for consumption were 23,646,000 lb during the first 10 months (17,406,000 during the entire year 1952). These represent material on which the duty has been paid and concentrates received duty-free for United States Government account. Imports for consumption of ferrotungsten were 538,000 lb (10 months) (479,000 during the entire year 1952). All import data refers to pounds of metal content.

Consumption declined slightly according to preliminary data. Increased consumption in steel was offset by a decline in tungsten metal (mainly for conversion to carbides) and chemicals. Removal of end-use restrictions was followed by a slight increase in the relative quantity of type B (high-tungsten) high-speed steel compared to type A (low tungsten). Wah Chang Corp., installed new furnaces for producing hydrogen-reduced tungsten powder; the first units are in production.

London price quotations dropped sharply in January, remained firm until late October, and again dropped sharply; the price declined from the equivalent of $50 per short ton unit to $20 during the year. *E&MJ* quotations for imported concentrates followed the same trend from $52.50 per short ton unit, duty extra, on Jan. 1, 1953 to $23.50 at the end of December. Noteworthy was the reversal of the premium position of wolframite and scheelite.

Forecast. Although less than half the tungsten consumed is used directly in steel, consumption of concentrates follows production of steel. Since 1946 about one-tenth pound of tungsten has been used, for all purposes, per ton of total steel produced. If this relation holds in the future and the steel industry works at full capacity, consumption of tungsten will be about 12-million pounds a year•

Molybdenum

ROBERT W. GEEHAN
Assistant Chief
Ferrous Metals and Alloys Branch

AN ALL-TIME HIGH for United States molybdenum production was reached during the second half of 1953. For the entire year production increased 36%. Consumption of concentrates and shipments of primary products each declined 3%, according to preliminary data.

Domestic production of molybdenum in concentrates, 47,813,000 lb (10 months), came from 6 states. Production from byproduct sources, mainly copper mines, increased 5%. Output of molybdneum mines increased 60%, reflecting new capacity at the Climax mine

Molybdenum Concentrates in the U. S.

Thousands of pounds	1952	1953
Production	43,259	58,800[1]
Consumption	32,715	31,700[1]
Exports[2]	6,172	5,837[3]

[1] Estimate for year.
[2] Includes roasted concentrates; these also appear in "Consumption."
[3] First 10 months.

in Colorado. At Climax, production came from both the Phillipson level and new workings developed from the Storke level 300 ft. lower. Mill capacity was increased, and much auxiliary construction completed. A contract negotiated with the Government in 1952 provides for an investment of $9.5-million by Climax Molybdenum Co. to provide for production from submarginal ore. A low-grade area was being developed from the Phillipson level, and a mill unit was under construction to beneficiate this ore. Large-scale production is expected early in 1954.

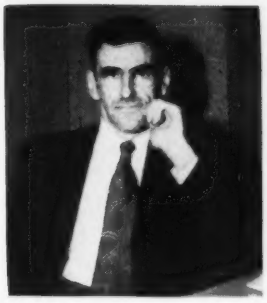
Preliminary estimates indicate that the U.S. produced over 90% of the world output with no data available for current production in Russia.

Consumption of concentrates and shipments of primary products dropped in the second half despite removal of end-use restrictions at the end of June, consumption of concentrates and shipments of primary products declined in the second half. Monthly shipments to domestic destinations averaged 2,721,000 lb for January-June and 2,324,000 lb for July-October.

At the end of June allocation of molybdenum was terminated by IMC. In September the United Kingdom removed restrictions on the use of molybdenum in alloy steels. Export of concentrates and products declined during the second half of 1953. Noteworthy was the decline in shipments to France, Germany and Sweden.

Outside the U. S., Molybdenite Corp. of Canada, Ltd. started development and construction to expand production at the La Corne mine, Quebec. A contract between this firm and the U. S. Government was announced in May. The company produced nearly 500,000 lb of molybdenite in 1952. The only other large-scale production during 1953 was a byproduct of copper mining in Chile; however, Austria, Japan, Norway, Peru and Yugoslavia continued to produce some•

Manganese



GILBERT L. DeHUFF, JR.
Commodity-Industry Analyst,
Bureau of Mines

Manganese-Ore Statistics

Short Tons[1]	1952	Estimated 1953
Domestic production	116,300	160,000
Domestic consumption	1,809,000	2,300,000
Exports	9,700	8,000
Imports	2,669,000	3,500,000

[1] Includes all ore 35% or more manganese.

MANGANESE IMPORTS, consumption and industry stocks reached new high levels in 1953, and domestic production was greatest since 1945.

Domestic production (ore, concentrate and nodules), aided by the start of nodule production by Manganese, Inc., at Henderson, Nev. and the G.S.A. domestic purchase program, reached approximately 160,000 short tons, of which 10% was battery-grade material. Montana, with Anaconda Copper Mining Co.'s nodule production, was again the principal producer. Shipments of ferruginous and manganiferrous ores were again approximately 1-million tons (90% came from Minnesota). G. S. A. depots at Deming, N. Mex., Butte and Philipsburg, Mont., and Wenden, Ariz., continued to receive manganese-bearing ores under the three manganese-purchase programs for low-grade domestic ores. The final data for registration in these programs, and in the "carlot" program for procuring high-grade ores, was advanced to June 30, 1954, and the terminal date was extended to June 30, 1958.

Imports of ore through September 1953 reached 2.5-million short tons, with indications that the year's total would be a record 3.5-million tons. India was the leading supplier with approximately one-third of the total. As in 1952, India, Gold Coast, Union of South Africa, and Cuba provided three-fourths of the total imports.

Russian manganese ore was offered after a lapse of 2 years, and the first shipment of such ore to Great Britain since before World War II was reported late in the year.

Consumption of manganese ores and estimated production of ferromanganese for 1953 were at all-time records of 2.3-million tons, (900,000) respectively, but a drop in rate of alloy producton and consequently of ore consumption, was evident by the end of the year. Imports of ferromanganese were the highest for many years at approximately 125,000 tons, and industry's stock of ore and alloys

continued to grow. Government allocation of manganese ores was eliminated May 19.

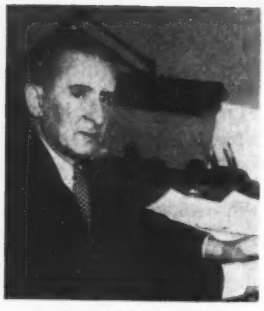
Construction of new plants for production of alloys was a feature of 1953. Mangaslag, Inc. constructed its plant at Pittston, Pa., for producing ferromanganese from open-hearth slags. Growing use of manganese as a substitute for nickel in alloy steels increased demand for electrolytic manganese and construction of new plants more than doubled capacity. This market dropped at the end of the year, however. Increased demand for low-carbon ferromanganese also resulted in doubling capacity.

At Henderson, Nev., Pioche Manganese Co. began electric-furnace production of ferromanganese from the low grade complex ores of the Pioche district. Silicomanganese, produced from rhodonite in an electric furnace at the Albany, Ore. station of the Bureau of Mines was tested successfully in the open hearth of an eastern steel company recently.

In June DMPA announced signing of a contract with E. S. Nossen Laboratories, Inc., Paterson, N. J. for installing a half-million-dollar pilot plant to test its nitric acid process for recovering manganese for low-grade materials. These developments illustrate the interest in lower-grade materials and technology.

For 1954, a further increase in domestic production of manganese ore is to be expected under the guarantee of assured high Government prices, but production of alloys and consumption of ore probably will be somewhat lower, depending on the rate of steel production. This decrease in industrial demand, coupled with reentry of Russian ore into world trade, may very possibly cause further softening in the commercial price of ore, but the grade of ores offered the consumer should not deteriorate further and may improve•

Cobalt



HUBERT W. DAVIS
Commodity Specialist,
Ferrous Metals and Alloys Branch

Cobalt Statistics

Pounds	(10 months) 1953
U. S. Production	2,194,000
U. S. Imports	11,278,000
Belgium and Bel. Congo	10,240,700
Canada	584,100
Germany	284,900
Norway	168,300

WORLD PRODUCTION OF COBALT continued its upward trend in 1953 and was substantially greater than in 1952, when about 10,000 metric tons was produced. U. S. imports in the first 10 months were 11% greater than during the corresponding period of 1952.

Noteworthy were the initial receipt of cobalt from Norway, imports of metal from Germany for the first time since 1939, and the receipt of 124,020 lb of cobalt sulphate from United Kingdom. As a result of improved supply, allocation and end-use restrictions were discontinued on June 30. Despite this, consumption of cobalt dropped in the last 6 months. Nevertheless, total consumption in 1953 should approach the record high of 1952—10,818,000 lb. Noteworthy was the much greater use of cobalt in permanent-magnet alloys in 1953, and consumption would have been still larger had more nickel been available.

U. S. supply. Production of cobalt metal for 10 months was 2,194,000 lb, 34% more than in the corresponding period of 1952. Imports were 11,278,000 lb, a gain of 16%. Production of oxide (gross weight) was 527,962, down 21%. Imports totaled 610,054 lb, up 73%.

Consumption was 9,186,000 lb during the first 10 months compared with 8,586,000 lb in the corresponding period 1952. Cobalt-chromium-tungsten-molybdenum alloys represented 50% of cobalt consumption but the quantity used was 12% less than in 1952. Magnet alloys took 22%, a 60% increase. More cobalt was used in high-speed and low-cobalt alloy steels, alloy hard-facing rods, ground-coat frit, and pigments; less in cemented carbides.

AMONG THE PRODUCERS

Bethlehem Steel Co. and Calera Mining Co. continued to be the only producers of cobalt concentrates from domestic ore. Production (cobalt content) was 1,012,000 lb compared with 1,093,000 lb in the first 10 months of 1952.

Mechanical difficulties plus severe corrosion and abrasion have hampered production at the new Garfield (Utah) refinery of Calera Mining Co. The initial shipment was made in May.

Cobalt-nickel-copper separation plant of Cobalt-Nickel Reduction Co. (subsidiary of National Lead Co.) at Fredericktown, should be completed early in 1954. Annual planned production is 700 tons of cobalt, plus nickel and copper.

Union Miniere du Haut-Katanga, Belgian Congo, enlarged its refinery at Jadotville.

Electrolytic cobalt unit of Falconbridge Nickel Mines, Ltd., at Kristiansand, Norway, was producing about 400,000 lb annually.

Refinery of Sherritt Gordon Mines, Ltd., was scheduled for completion about April 1954. Annual planned production includes 150 tons of cobalt, plus nickel and copper.

Quebec Metallurgical Industries, Ltd., completed its smelter at Cobalt, Ont., to produce cobalt, nickel and silver. The company is developing a property in Idaho•

Nickel

HUBERT W. DAVIS
Commodity Specialist,
Ferrous Metals and Alloys Branch

NEW NICKEL-PRODUCING facilities and expansion of the old made progress in 1953, but no refining units were completed; however, largely because of increased output in Cuba, supplies of nickel were moderately greater than in 1952 but again were inadequate for industry requirements and Government stockpiling. Despite short supply, allocation and end-use restrictions on nickel were discontinued Nov. 1. Some improvement in the supply position will materialize in 1954, when new facilities are completed.

Canadian output during the first 9 months was 105,892 short tons. Exports were 108,840. Output of nickel oxide in Cuba was about 14,000 tons (nickel content) compared with 8,958 tons in 1952.

Consumption in the U. S. is estimated at 106,000 tons for the year, or 5% more than in 1952. Gains were most pronounced for engineering alloy steels, anodes, and cast irons, but more was also used in high-temperature and electrical-resistance alloys, ceramics, and magnets. Use of nickel in stainless steels declined, and there was smaller consumption in nonferrous metals and catalysts.

Import figures are given in the accompanying table. Imports of oxide from Cuba were 12,630 tons (gross weight) in the first 10 months.

Nickel Statistics

Short tons	1952	1953 (est.)
United States:		
Imports	108,200	118,000
Consumption	101,048	106,000
Canada:		
Production	140,559	141,000
Exports	142,022	145,000
Cuba:		
Production	8,958	14,000
Price per lb.[1]	56½c	56½-60c

[1] Electrolytic nickel in carlots, f.o.b. Port Colborne, Ont., including duty of 1¼ cents.

KEY DEVELOPMENTS

International Nickel Co. of Canada, Ltd., concluded a 5-year contract with DMPA to provide 60,000 tons of metallic nickel beginning in January 1954. Deliveries are made possible by a process for treating nickel-bearing pyrrhotite for the recovery of nickel and iron making available 10-million tons of ore previously considered uneconomical.

Falconbridge Nickel Mines, Ltd., also executed a contract with DMPA to deliver 50,000 tons of nickel. A contract to provide 25,000 tons was entered into in 1952. Largely as a result of these contracts, much mine development and construction work was in progress. Sinking of two shafts was begun at the Fecunis mine, and the Hardy, Falconbridge East, and Mount mines, were expected to be brought into production in 1954. The third blast furnace at the smelter began operating in October. The smelter and refinery of Falco are now geared to handle over 15,000 tons nickel.

Hanna Coal & Iron Corp. and Hanna Nickel Smelting Co. entered into agreement with DMPA to produce 95,000,000 to 125,000,000 lb of nickel contained in ferronickel averaging at least 25% nickel by June 30, 1962. The ore deposit near Riddle, Ore., averages about 1½% nickel, and will be mined by open-pit methods. The smelter will have four primary furnaces, one refining furnace and two auxiliary furnaces. The mine is expected to get into operation during the summer of 1954, the smelter by the following October. Annual capacity will be 7,000 to 9,000 tons of nickel contained in ferronickel.

DMPA contracted with Western Nickel, Ltd. for 42-million lb of refined nickel; production is scheduled to begin in 1955, and delivery will be at a rate of 6-million lb annually for 7 years. Deposit is near Choate, B. C.

Chemical metallurgical plant of Sherritt Gordon Mines, Ltd., was not completed on schedule because of delays in deliveries of essential equipment. Treatment of concentrates should begin in April 1954, with the first production of nickel metal about 1 month later. Annual planned production is 8,500 tons of nickel, 150 tons of cobalt, and 4,500 tons of copper. One unit of the company concentrator at Lynn Lake, Manitoba, went into operation at the end of October. Additional units will be put into operation as required to handle increasing output from the "A" orebody and ore from preliminary stoping operations at the "El" orebody.

Nickel-cobalt-copper separation plant of Cobalt-Nickel Reduction Co. (subsidiary of National Lead Co.) at Fredricktown, Mo., was expected to be completed during the first quarter 1954.

Bureau of Mines, under an agreement with DMPA, continued drilling in the Levisa Bay district of Cuba. By November over 20-million tons of ore with an average grade of about 1.35% nickel and 0.09% cobalt had been indicated. Sintering equipment was installed at the Government-owned nickel plant at Nicaro, Cuba. A low-cost process for converting Cuban oxide to metal was developed by the Bureau of Mines.

Discovery of a large nickel deposit in the Moa Bay area of Cuba was announced by Freeport Sulphur Co. The deposit is reported to contain at least 40-million tons of ore averaging about 1.35% nickel and 0.14% cobalt. The company hopes to be in commercial production in 1955 with a minimum initial output of 15,000 tons annually.

Allocation of primary nickel (excluding nickel salts) to the free-world countries by the International Materials Conference was discontinued after September.

Order M-80, which controlled the distribution and end use of nickel in the United States, was revoked effective Nov. 1. However, priority for the needs of the military and atomic energy and for stockpiling remained in effect.

Chromite Statistics in U.S.

Thousands of short tons	1952	Estimated 1953
Imports	1,700	2,200
Production (shipments)	21	58
Consumption (Total)	1,186	1,334
Metallurgical	677	739
Refractory	387	443
Chemical	122	152

Chromite Prices in 1953

Source	Cr_2O_3 %	Cr:Fe Ratio	Prices per long ton* January	December
Pakistan	48	3:1**	$53-$54	$51-$52
Southern Rhodesia	48	3:1**	44-46	44-46
Southern Rhodesia	48	2.8:1	40-42	40-42
Southern Rhodesia	48	—	32-33	32-34
South Africa (Transvaal)	48	—	34-35	33-34
South Africa (Transvaal)	44	—	27-28	23-24
Turkey	48	3:1**	55-56	53-54

*Quotations are on a dry basis, subject to penalties if guarantees are not met, f.o.b. cars, east coast ports. **Lump ore.

Chromium

CHARLES KATLIN
Commodity-Industry Analyst
Ferrous Metals and Alloys Branch

REFLECTING THE RISING INTEREST in the metallurgical uses of chromium, consumption of all chromite during 1953 was 10% above the former record year of 1951, despite a sharp drop in metallurgical consumption during the final quarter. Consumption of chromium metallurgical products, such as ferrochromium, other primary alloys and metal, also increased to the highest point attained to date; 63.5% of these products went into stainless steels.

U. S. Production. With the entrance of the Mouat Chrome mine in Montana as a producer in August, it appeared likely that U. S. output of chromite would be almost 2½ times that of 1952. Mill capacity at the Mouat mine is 1,000 tons per day, with an output of about 370 tons of concentrate averaging 38% Cr_2O_3. The Government is currently purchasing the concentrate under a contract with American Chrome Corp., which guarantees purchase of 900,000 tons over an 8-year period. Current price is $34.97 per ton.

All through the chrome-bearing serpentine areas of California and Oregon, old mines were being reactivated and new prospects developed under stimulus of the high-incentive prices ($115 per long dry ton or 48% Cr_2O_3, lump, 3:1 Cr/Fe ratio) paid under the Domestic Chrome Purchase Program.Termination date of this program was extended to June 30, 1957, and the limit was cancelled on the quantity of purchases permitted from any one operation. Well over 100 operators were shipping ore and concentrates to Grants Pass.

A Government contract was made with Kenai Chrome Co. (Alaska) for 13,000 long tons of lump chromite by the end of 1955. First shipments are expected in 1954.

Imports. To satisfy increased demand for industrial consumption and stockpiling, foreign ore was imported at record rates, passing the 2-million short-ton mark before the year's end. During the first 10 months, metallurgical ore comprised over half of all imports, with Turkey supplying 39%, Southern Rhodesia 22%, and Union of South Africa 16%. The Philippines was the source of 87% of all refractory ore as well as some of metallurgical. All chemical ore originated in the Union of South Africa. Efforts were reportedly made by the Soviet Union to resume chrome exports to the western world, but no shipments were made to the U. S.

Of considerable metallurgical interest was creation by the U. S. Bureau of Mines of a chromium metal displaying ductility at room temperatures by removal of the surface coating from metal made from arc-melted, hydrogen-reduced, electrolytic chromium.

At a new plant in Marietta, Ohio, Electro-Metallurgical Corp. initiated the first comercial production of electrolytic metal.

Pacific Northwest Alloys Corp., after a lapse of 2 years, resumed production of ferrochrome at its Mead, Wash., plant.

First ferrochrome to be made in Africa was shipped to American and British steel companies on trial consignments. Rhodesian Alloys, Ltd., manufactured the alloy at Gwelo, Southern Rhodesia, in a pilot plant reported to have an annual capacity of 5,000 to 7,000 tons of low-carbon ferrochrome, 70% chromium content.

During 1954 domestic production of chromite should exceed 150,000 short tons, placing the U. S. among the first half-dozen of the world chrome producers. Since most of this tonnage will be low-grade concentrates as are most of the world's known reserves, ferroalloy makers probably will increase their use of the lower grade ores in gradual preparation for the inevitable•

E & M J Annual Average Metal Prices—1897 to 1953

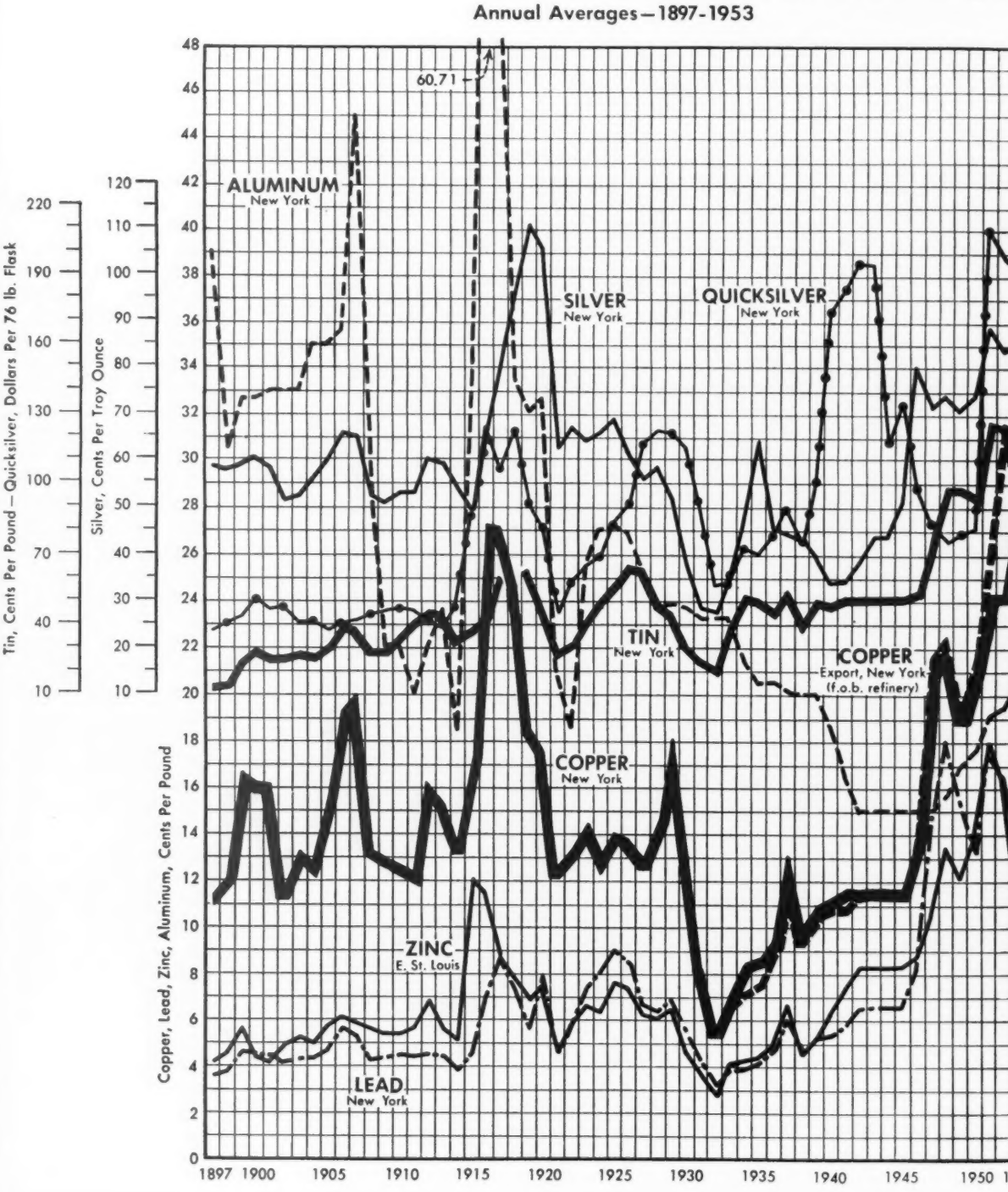
Year	COPPER, (a) Electrolytic Refinery	COPPER, Export or Foreign Refinery	LEAD, Common, N. Y.	ZINC, Prime Western (b) E. St. Louis	TIN, (c) N. Y.	SILVER, (e) N. Y.	QUICKSILVER, (f) N. Y.	ALUMINUM Ingot
1897	11.29	.....	3.580	4.120	13.67	59.790	38.50	39.00
1898	12.03	.....	3.780	4.570	15.70	58.260	40.70	30.58
1899	16.67	.....	4.470	5.750	25.12	59.580	43.63	32.72
1900	16.19	.....	4.370	4.390	29.90	61.330	51.00	32.72
1901	16.11	.....	4.330	4.070	16.74	58.950	47.00	33.00
1902	11.026	.....	4.069	4.840	26.79	52.160	48.03	33.00
1903	13.235	.....	4.237	5.191	28.09	53.570	41.32	33.00
1904	12.823	.....	4.309	4.931	27.99	57.221	41.00	35.00
1905	15.590	.....	4.707	5.730	31.358	60.352	38.50	35.00
1906	19.278	.....	5.657	6.048	39.819	66.791	40.90	35.75
1907	20.004	.....	5.325	5.812	38.166	65.237	41.50	45.00
1908	13.208	.....	4.200	4.578	29.465	52.864	44.84	28.70
1909	12.982	.....	4.273	5.352	29.725	51.502	46.30	22.00
1910	12.738	.....	4.446	5.370	34.123	53.486	47.06	22.25
1911	12.376	.....	4.420	5.608	42.281	53.340	46.54	20.07
1912	16.341	.....	4.471	6.799	46.096	60.835	42.46	22.01
1913	15.269	.....	4.370	5.504	44.252	59.791	39.54	23.64
1914	13.602	.....	3.862	5.061	34.301(d)	54.811	48.31	18.63
1915	17.275	.....	4.673	13.054	38.590	49.684	87.01	33.98
1916	27.202	.....	6.858	12.634	43.480	65.661	125.49	60.71
1917	27.180	.....	8.787	8.813	61.802	81.417	106.30	51.59
1918	24.628	.....	7.413	7.890	88.750	96.772	123.47	33.53
1919	18.691	.....	5.759	6.988	63.328	111.122	92.15	32.14
1920	17.456	.....	7.957	7.671	48.273	100.900	81.12	32.72
1921	12.502	.....	4.545	4.655	29.916	62.654	45.46	21.11
1922	13.382	.....	5.734	5.716	32.554	67.528	58.95	18.68
1923	14.421	.....	7.267	6.607	42.664	64.873	66.50	25.41
1924	13.024	.....	8.097	6.344	50.176	66.781	69.76	27.03
1925	14.042	.....	9.020	7.622	57.893	69.065	83.13	27.19
1926	13.795	.....	8.417	7.337	65.285	62.107	91.90	26.99
1927	12.920	.....	6.755	6.242	64.353	56.370	118.16	25.40
1928	14.570	.....	6.305	6.027	50.427	58.176	123.51	23.90
1929	18.107	.....	6.833	6.512	45.155	52.993	122.15	24.300
1930	12.982	.....	5.517	4.556	31.694	38.154	115.01	23.787
1931	8.116	.....	4.243	3.640	24.467	28.700	87.35	23.300
1932	5.555	.....	3.180	2.876	22.017	27.892	57.93	23.300
1933	7.025	6.713	3.869	4.029	39.110	34.727	59.23	23.300
1934	8.428	7.271	3.860	4.158	52.191	47.973	73.87	23.300
1935	8.649	7.538	4.065	4.328	50.420	64.273	71.99	20.000
1936	9.474	9.230	4.710	4.901	46.441	45.087	79.92	20.000
1937	13.167	13.018	6.009	6.519	54.337	44.883	90.18	19.917
1938	10.000	9.695	4.739	4.610	42.301	43.225	75.47	20.000
1939	10.965	10.727	5.053	5.110	50.323	39.082	103.94	20.000
1940	11.296	10.770	5.179	6.335	49.827	34.773	176.86	18.691
1941	11.797	10.901	5.793	7.474	52.018	34.783	185.02	16.500
1942	11.775	11.684	6.481	8.250	52.000	38.333	196.35	15.000
1943	11.775	11.700	6.500	8.250	52.000	44.750	195.21	15.000
1944	11.775	11.700	6.500	8.250	52.000	44.750	118.36	15.000
1945	11.775	11.700	6.500	8.250	52.000	51.928	134.89	15.000
1946	13.820	14.791	8.109	8.276	54.544	80.151	98.24	15.000
1947	20.958	21.624	14.673	10.500	77.949	71.820	83.74	15.000
1948	20.038	22.348	18.043	13.589	99.250	74.361	76.49	15.733
1949	19.202	19.421	15.364	12.144	99.336	71.930	79.46	17.000
1950	21.235	21.549	13.296	13.866	95.539	74.169	81.26	17.713
1951	24.200	26.258	17.500	18.000	127.077	89.368	210.13	19.000
1952	24.200	31.746	16.467	16.215	120.473	84.941	199.097	19.410
1953	28.798	30.845	13.489	10.855	95.845	85.188	193.032	20.931

(a) Lake copper 1897-98; domestic market since 1932. (b) New York delivery 1898-1902. (c) 99 percent in 1897 to 1920, inclusive; Straits quality thereafter. (d) Average for eleven months. (e) New York market. All quotations in cents per lb., except for silver, which are in cents per troy oz., and (f) quicksilver, which are in dollars per flask of 76 lb.

E & M J Me

As Published in Engineering & Mining Journ

McGraw-Hill Publishing C

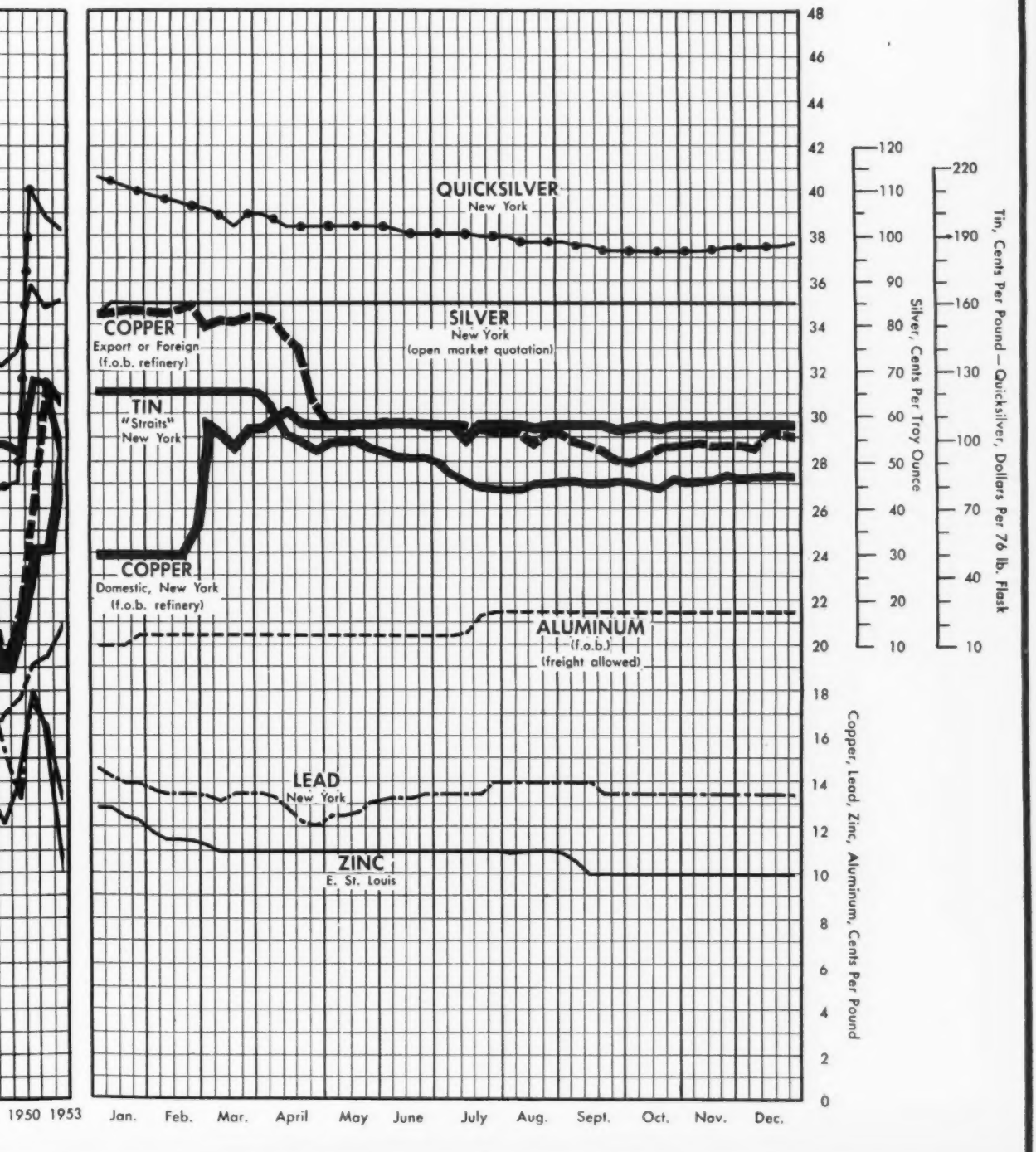


letal Prices

ournal and E&MJ Metal and Mineral Markets

ng Company, Inc., New York

Weekly Averages—1953



E & M J Weekly Average Metal Prices—1953

	COPPER		LEAD	ZINC	TIN	SILVER	QUICK-SILVER	ALUM-INUM
	Domestic Refinery	Foreign, Refinery	N. Y., Common	E. St. Louis Prime Western	N. Y., "Straits"	N. Y., Foreign	N. Y.	99% plus, Ingot
Jan. 7	24.200	34.660	14.700	12.960	121.500	83.250	217.000	20.000
14	24.200	34.767	14.250	12.917	121.500	83.550	215.000	20.000
21	24.200	34.863	14.000	12.500	121.500	85.150	212.000	20.000
28	24.200	34.833	14.000	12.333	121.500	85.250	210.000	20.500
Feb. 4	24.200	34.792	13.750	11.833	121.500	85.250	208.000	20.500
11	24.200	34.713	13.500	11.500	121.500	85.250	207.000	20.500
18	24.200	34.917	13.500	11.500	121.500	85.250	205.000	20.500
25	25.106	35.100	13.500	11.475	121.500	85.250	203.000	20.500
Mar. 4	29.590	34.183	13.417	11.250	121.500	85.250	202.000	20.500
11	29.330	34.396	13.167	11.000	121.500	85.250	200.000	20.500
18	28.840	34.363	13.500	11.000	121.500	85.250	195.000	20.500
25	29.420	34.550	13.500	11.000	121.500	85.250	200.000	20.500
Apr. 1	29.470	34.567	13.500	11.000	120.833	85.250	200.000	20.500
8	29.945	34.296	13.375	11.000	114.750	85.250	198.000	20.500
15	30.215	33.550	12.917	11.000	102.000	85.250	195.000	20.500
22	29.765	33.067	12.250	11.000	96.000	85.250	195.000	20.500
29	29.680	30.771	12.083	11.000	94.250	85.250	195.000	20.500
May 6	29.640	29.854	12.500	11.000	95.750	85.250	195.000	20.500
13	29.670	29.642	12.500	11.000	97.938	85.250	195.000	20.500
20	29.700	29.671	12.708	11.000	98.917	85.250	195.000	20.500
27	29.685	29.663	13.083	11.000	96.542	85.250	195.000	20.500
June 3	29.695	29.742	13.250	11.000	95.500	85.250	195.000	20.500
10	29.685	29.788	13.250	11.000	93.167	85.250	193.000	20.500
17	29.680	29.738	13.500	11.000	92.917	85.250	191.000	20.500
24	29.695	29.600	13.500	11.000	92.979	85.250	191.000	20.500
July 1	29.690	29.617	13.500	11.000	90.750	85.250	191.000	20.500
8	29.695	29.642	13.500	11.000	85.150	85.250	191.000	20.500
15	29.690	29.596	13.500	11.000	82.167	85.250	191.000	20.583
22	29.675	29.446	13.625	11.000	79.833	85.250	190.000	21.250
29	29.680	29.325	14.000	11.000	79.500	85.250	190.000	21.500
Aug. 5	29.700	29.375	14.000	10.937	78.375	85.250	190.000	21.500
12	29.635	29.250	14.000	10.983	78.583	85.250	188.000	21.500
19	29.490	28.983	14.000	11.000	81.458	85.250	188.000	21.500
26	29.615	29.383	14.000	11.000	81.917	85.250	188.000	21.500
Sept. 2	29.670	29.229	14.000	10.917	82.917	85.250	188.000	21.500
9	29.669	28.983	14.000	10.500	82.850	85.250	186.000	21.500
16	29.685	28.804	13.917	10.083	81.708	85.250	186.000	21.500
23	29.650	28.600	13.500	10.000	81.917	85.250	184.000	21.500
30	29.480	28.196	13.500	10.000	82.583	85.250	184.000	21.500
Oct. 7	29.605	28.088	13.500	10.000	82.250	85.250	184.000	21.500
14	29.650	28.342	13.500	10.000	80.600	85.250	184.000	21.500
21	29.475	28.763	13.500	10.000	79.750	85.250	183.000	21.500
28	29.635	28.788	13.500	10.000	80.375	85.250	183.000	21.500
Nov. 4	29.688	28.808	13.500	10.000	81.900	85.250	183.000	21.500
11	29.688	28.929	13.500	10.000	82.050	85.250	183.000	21.500
18	29.615	28.767	13.500	10.000	82.583	85.250	184.000	21.500
25	29.630	28.821	13.500	10.000	84.750	85.250	185.000	21.500
Dec. 2	29.694	28.796	13.500	10.000	83.900	85.250	185.000	21.500
9	29.685	28.663	13.500	10.000	84.250	85.250	185.000	21.500
16	29.685	29.350	13.500	10.000	85.750	85.250	186.000	21.500
23	29.675	29.254	13.500	10.000	85.042	85.250	186.000	21.500
30	29.625	29.138	13.500	10.000	84.350	85.250	187.000	21.500

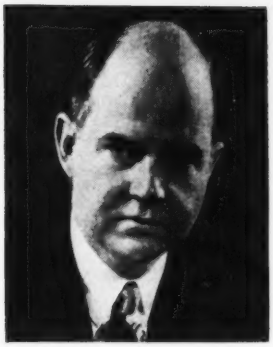
NONMETALLICS

Sulphur Mines on the Gulf Coast

Sulphur Production in the U.S.

(Long tons)	1952	Estimated 1953
Frasch sulphur	5,293,000	5,155,000
Other elemental	250,000	340,000
Sulphur in pyrites	418,000	434,000
Sulphur in gases	313,000	335,000
Total	6,274,000	6,264,000

Sulphur



- **U.S. has greatest number of mines in history**
- **Great demand matched high production**
- **For 1954—Sufficient sulphur**

LANGBOURNE M. WILLIAMS
President
Freeport Sulphur Co.

U. S. SULPHUR ACTIVITY in 1953 was marked by high production, close balance between supply and demand, and further expansion of productive facilities.

Total output of sulphur in the U. S. in all forms amounted to an estimated 6,264,000 long tons. This figure is very near the record level established in 1952.

Sulphur produced by the Frasch process—which accounted for about four-fifths of the total output of sulphur in all forms—came from salt dome deposits in Texas and Louisiana. Twelve mines are now in operation, the most in the industry's history.

Two of these mines, Garden Island Bay and Damon, were placed in operation late in the year. Garden Island Bay, located at the mouth of the Mississippi River, represents the largest sulphur development since the beginning of production at Grande Ecaille in 1933. The mining plant is designed to produce 500,000 long tons of sulphur annually. Initial production was obtained on Nov. 19. Damon, the other new mine, is located southwest of Houston. A small mining plant began operation Nov. 11.

Great demand matched the high rate of Frasch sulphur production. Shipments actually exceeded production by a slight amount, reducing sulphur stockpiles at the mines. These stocks, however, are still somewhat larger than two years ago. Frasch sulphur production and shipments in long tons for the past two years, and mine stocks at year end, have been:

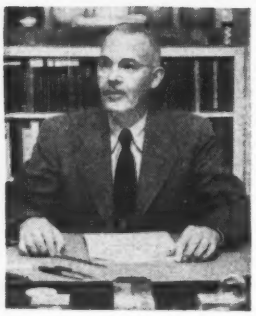
	1952	1953 (Est.)
Production	5,293,000	5,155,000
Shipments	5,141,000	5,230,000
Stocks	2,830,000	2,755,000

Of the shipments, an estimated 1,268,000 long tons were exported mainly to Canada, the United Kingdom, France. While this was slightly less than 1952 exports, foreign demand for U. S. sulphur continued to be heavy.

Development of non-salt dome sources continued to grow. Four projects to obtain sulphur from sour natural gas and two from refinery gas were placed in production. There now are 65 separate operations in the U. S. which recover sulphur from gases, utilize pyrites, mine surface deposits of sulphur, or obtain the mineral as sulphuric acid from the sulphur dioxide of smelter gases.

In 1954, following a year of high production, the sulphur industry begins with the full effect of the newest producing mines still to be felt and with other projects actively under way. Two of these projects are being undertaken by Freeport—the virtually completed Nash mine in Texas and Chacahoula in Louisiana, scheduled to be in operation in 1955. Sulphur from these and the other newly developed deposits will be an important factor in helping to meet the growing long-term demand for sulphur•

Potash



- **Drilling extends reserves 50 years**
- **Industry invests $12-million in expansion**
- **For 1954 — Continued expansion and technological development**

G. T. HARLEY, Consultant
International Minerals And
Chemical Corp.

AS THE YEAR 1953 reached its end, seven major potash companies were in continuous operation in the U. S.; five in the Permian Basin east of Carlsbad, N. M.; the other two are: American Potash and Chemical Corporation, producing from Searles Lake brines at Trona, Calif.; and Bonneville, Ltd., producing from the brines of Great Salt Lake at Wendover, Utah.

As a result of the operations of the two new companies, the production of finished material, including imports, exceeding 3,250,000 tons, or the equivalent of 1,900,000 tons K_2O. This is an increase of 10% of finished material and 11% K_2O over last year's production, and constitutes an all-time high for the industry.

Approximately 90% of the United States' production comes from New Mexico.

Imports of K_2O into the United States from foreign countries are not yet fully known, but exports were approximately 2,800 tons of finished material or 1,710 tons of K_2O. Of the total apparent consumption in the United States, 3,080,000 tons of finished material was delivered for agricultural purposes and 170,000 tons of finished material was delivered to the chemical industry during the year.

Prospect drilling was vigorous, continued at a substantial rate during the entire year by all companies in the New Mexico area and large increases in the ore reserves of the district were disclosed. Freeport Sulphur Co. and Farmers' Educational Cooperative Union of America, and International Minerals & Chemical Corp. drilled a large area in Lea County. The potash reserves found there apparently constitute one single ore body which has not yet been fully delineated, but which may well prove to be the largest yet discovered in the Basin.

In all, it is conservatively estimated that, in spite of ore removed during the past twenty-two years, drilling has increased the reserves in Permian Basin by about fifty years, if mining continues at its present rate.

COMPANY DEVELOPMENTS

United States Potash Co. is still working on a long drive to the north to connect with its new No. 3 shaft which is being sunk. Additional plant equipment for slightly increased production of highgrade muriate and improved recovery went into service. Changes and additions to the plant at the mine were completed about June 1 and the production of granular muriate has been changed from 50% to 60% K_2O material.

Potash Company of America announced a $3-million modernization and expansion program in February for its mine and refinery east of Carlsbad. This program calls for installation of new equipment, designed to give greater efficiencies as well as to permit larger output. The larger proposed expenditure will be in the mine and will include the addition of four P.C.A. model 150 continuous mining machines, which have been designed and built by the company employees and for which patent applications have been filed. Potash Company of America has also recently placed in operation four Joy continuous mining machines, and is contemplating the installation of several more, the type of which presumably will depend on results of current work. Improvements are being made in the underground haulage system. In the refinery, modernization of equipment to improve recovery of potash and increase capacity handled, has been recently completed.

International Minerals & Chemical Corp. has practically completed a $6,250,000 expansion program which includes a magnesium oxide-hydrochloric acid plant, expansion of the pure KCl and sulphate plants, refinery changes to increase production of muriate and Sul-Po-Mag, and construction of a new 100,000-ton muriate storage building. A large-scale pilot plant for the LeBaron-Lawver dry benefication process is now in operation under test conditions.

Capacity of the hoist at the main shaft has been doubled by installing a 1750 hp synchronous motor generator and an additional 800-hp dc motor on the hoist. Outstanding feature of this installation is the location of the hoistman at the collar of the shaft instead of in the hoist house. The hoist is completely automatic and remotely controlled.

Duval Sulphur & Potash Co. has completed initial installation of belt conveyors for underground haulage. The system includes semi-portable 36 x 54 single roll crushers discharging to 30 in. belt conveyors as the working face advances. Belt will be extended so that at all times shuttle cars will discharge directly to the semi-portable crushers. Additional surface facilities included a second 50,000-ton production storage warehouse, a laboratory extension for research and development personnel and an equipment warehouse.

Southwest Potash Company has also constructed a 100,000-ton storage warehouse. Minor changes have been made in the process flow sheet as a result of experimental work, and it is reported that Southwest is experimenting

with a Wemco Heavy Media machine to produce granular muriate.

Freeport Sulphur Company, after having developed what is reported to be a considerable tonnage of ore, is making detailed plans and estimates to evaluate their holdings and determine the feasibility of the potash production.

Farmers' Educational Cooperative Union of America is still drilling out its holdings and to date no concrete plans are known.

FORECAST

The rapidly expanding potash industry in New Mexico spent approximately $12-million in 1953 for new equipment, plant expansion and improved metallurgy. A great deal of interest is being shown in development and improved use of continuous miners, extension of belt haulage transportation, and in use and improvement of jumbo drills. Willys diesel powered jeeps and Dodge power wagons, rubber tired, are in use.

Continued improvement in this industry can be confidently predicted for 1954, and improved equipment will be used to the utmost as it is developed and becomes available•

Fluorspar

- **For the first time in years, fluorspar supplies were ample**
- **Consumption established a record**
- **On the horizon is fluorine from phosphate rock**

JOSEPH C. ARUNDALE, Assistant Chief
Construction and Chemical Materials
Bureau of Mines

Contrasting with conditions in recent years, supplies of fluorspar in 1953 were ample. About 325,000 short tons of all grades of finished fluorspar was produced in the U.S., 25,000 tons less than in 1952. Most of the decline was in metallurgical-grade and some producers attributed this to competition from foreign fluorspar. The Illinois-Kentucky district again was the major production area but recent new discoveries and developments have added to the capacity and potential of some Western States.

Imports were down slightly from the previous year, but for the second straight year they were about equal in tonnage to domestic production. Mexico continued to lead but Spain, Italy, Canada, and West Germany made contributions.

Consumption established a record. An estimated 600,000 tons were consumed in steel making, fluorine chemicals, ceramics, and lesser uses. This compares with 521,500 tons in 1952 and continues the trend of increasing requirements in the past several years.

Chemicals. Much of this increase can be attributed to the growth of the fluorine chemicals industry. An estimated 225,000 tons of chemical-grade fluorspar was consumed for that purpose in 1953 compared with about 180,000 tons in 1952.

Steel. Basic steel production, a record 107,000,000 tons, meant a consumption of about 300,000 tons of fluorspar.

Stocks in hands of consumers had by the first of 1953 reached an all-time high but decreased steadily throughout the year.

Company Developments. The new 300-ton flotation plant of St. Lawrence Fluorspar, Inc. was completed at Wilmington, Del., in December. The mine in Newfoundland will supply at least a portion of the mill feed with probably some foreign tonnage. The firm has a contract with GSA to ship a part of its production to the Stockpile.

The 100-ton flotation mill of Fluorspar Mines, Inc., at Meyers Cove, Idaho, was destroyed by fire in April. The company was undecided on rebuilding.

United States Steel Co. began operation of a new Heavy-Media and flotation plant at Mexico, Ky. Minerva Oil Co. completed a flotation mill annex at its Crystal plant in Illinois to convert part of the ore to acid or ceramic grade fluorspar and to recover fine fractions previously wasted.

Foreign Developments. Recent discoveries of fluorspar deposits in Mexico and construction of milling facilities greatly increased the potential of that country.

Prices. High level of stocks and increasing availability of foreign fluorspar tended to weaken prices. Prices early in the year were quoted at $50 per ton for acid-grade, and $38-$43 per ton for metallurgical grade. By the end of the year they were down to $57.50 and about $38-$42.50. However, many purchases reportedly were made at even lower prices.

Forecast. Long range forecasts of steel output indicate a fluorspar requirement for this purpose of possibly 350,000 short tons annually by 1960. New uses for fluorine chemicals, increasing requirements for aluminum, plastics, aviation gas, propellants, refrigerants, and expanding atomic energy program point to the possibility in the next 10 to 15 years of a requirement for acid-grade fluorspar of two or three times the current rate. This is the field with greatest growth possibilities.

It is likely that an increasing percentage of supplies will come from foreign sources and their availability will continue to affect domestic prices.

An important factor in the outlook for fluorspar is the possibility of developing a commercial process for the recovery of fluorine as synthetic fluorspar, cryolite, or hydrofluoric acid from phosphate rock. A large tonnage of fluorine potentially is available from that source and much research has been and is being done•

Perlite

- **In '53, a lower unit price but more production**
- **Outstanding developments were standardization, wider acceptance and a Canadian market**
- **Outlook — Bright with huge potential markets**

S. W. JOHNSON, President
Lightweight Products Co., Irving, Texas

REVIEW

THE PERLITE INDUSTRY continued its growth in 1953 as it has each year since expanded perlite was introduced in quantity in 1946. According to year-end estimates by the Perlite Institute, total production of expanded perlite in 1953 reached an estimated 178,000 short tons, or about 15% more than 1952. Value of the 1953 production, estimated at 9-million, averages about 84c a bag (4 cu ft). Sales price per bag in 1952, according to figures compiled by the U.S. Bureau of Mines, averaged 86½c.

The Perlite Institute figures indicate a total production of crude perlite ore for 1953 at about 189,000 short tons with an estimated value of $1,150,000 at the mine. This would give an average value per short ton at the mine of $6.08. I am inclined to believe the $6.08 figure is conservative since all major producers are selling at substantially higher figures. Probably $6.93 would be more in line with average quoted prices which would give a total valuation of $1,309,770. Not all producers are members of the Perlite Institute and production of non-members will be available only through the Bureau of Mines. Accompanying is a tabulation of production figures for 1952 and estimated for 1953.

Estimated average price per short ton of expanded perlite in 1953 is $50.50 as compared to $51.74 in 1952. It is interesting to note that while volume has continued to rise from year to year a tapering off was begun in 1951 and subsequent increases have been more in line with normal growth.

The rapid increase in volume and value through 1950 reflects the period of geographic expansion and minimum competition. The more gradual increase in volume and the trend toward lower prices since 1950 reflects saturation of geographic market areas and the onset of serious competition.

Perlite — This Year and Last

	1952*	Estimated 1953
CRUDE PERLITE		
Production (short tons)	190,442	218,000
Sales (short tons)	135,070	155,000
Value	$873,054	$1,162,500
Own consumption (short tons)	29,775	34,000
Value	$129,886	$147,270
EXPANDED PERLITE		
Production (short tons)	155,955	178,000
Sales (short tons)	154,563	176,000
Value	$7,997,731	$8,900,000

*U.S. Bureau of Mines Report MMS No. 2216

KEY DEVELOPMENTS

Three new developments in 1953 are likely to affect the perlite industry for some time to come.

1. The Perlite Institute in June 1953 launched a nationwide certification and labeling program for perlite plaster aggregate. Under this program, participating manufacturers are licensed to use a copyrighted seal on bags which guarantees that the material conforms to revised ASTM Specification C 35-33 T. To enforce strict quality control, agents of Pittsburgh Testing Laboratory make unannounced visits to each participating plant at least four times a year to secure and test samples of aggregate. Should the producer's material fail to meet the specification, his right to use the seal is immediately suspended.

By the end of 1953, 33 perlite manufacturers had signed certification agreements with the Institute, and 26 companies were actively marketing a certified perlite plaster aggregate.

In addition to building consumer confidence, the certification program has caused expanders to insist that perlite miners take extra care to ship only carefully graded crude perlite which will meet the ASTM specification when properly expanded. The result has been greater emphasis on quality control by both expanders and miners.

2. Perlite has now been recognized as an ideal plaster aggregate by all of the major gypsum companies. By the end of 1953 all of the large gypsum producers were distributing mill-mixed perlite and gypsum for plaster. Some of the gypsum producers have installed their own perlite process plants.

3. A sizeable new market for perlite miners seems to be developing in Canada. At least four expanding plants are already in operation there and several others are now

under construction. While Canada has perlite deposits in its western provinces, freight rates makes it more economical for plants in eastern Canada to purchase crude perlite from U.S. miners.

More attention was given in 1953 to producing aggregates designed for specific applications, rather than to produce an all-purpose aggregate as has been general practice in the past. With pumps like E-Z-On it is possible to spray perlite plaster or concrete mixes on a wall or ceiling and a new concept in building has been introduced. More friable aggregates are better suited for pump applications as they are not as hard on equipment. Compressive action of the pump gives high in-place strengths to plaster or concrete. Placement is much faster and costs less. Use of curtain wall construction with placing of the concrete or plaster by pump is finding increasing favor.

FORECAST

The outlook for the perlite industry in 1954 appears to be good. While total volume of building construction in this country is expected to decrease slightly, the perlite industry as a whole anticipates another substantial increase in sales. Aggressive competition between separately bagged perlite aggregate and the newer mill-mixed perlite-gypsum should enable perlite to capture an even greater share of the plaster aggregate market.

At the same time, independent perlite producers are expected to devote increasing attention to the sale of perlite aggregate for insulating concrete. An enormous potential market exists for both poured-in-place and precast perlite-portland cement concrete for roof insulation, and as a lightweight floor fill in multiple story buildings•

Barite

- **Domestic production is static**
- **Imports continue to rise rapidly**
- **New plants will process foreign ore**

REGINALD ROWLAND, Production Mgr.
Baroid Sales Div., National Lead Co.

FROM ALL INDICATIONS, domestic production of crude barite in 1953 will be close to the 1952 figure of 1,012,800 short tons. This static situation is due principally to increased imports. World production is an estimated 2,100,000 tons (2-million in 1952). The U.S. produces about 50% of the world output and consumes approximately 56%.

Arkansas again leads in domestic output, although 1953 shipments may show a slight decrease from the 428,500 tons in 1952. Two producers, one open pit, one underground, supply all the production. Both mine a relatively low grade ore and beneficiate by jigging and flotation. One operator is currently expanding.

Missouri should produce, in 1953, about the same tonnage as in 1952, 304,100. Three washing and jigging plants were built and there has been some expansion in grinding facilities.

Nevada will probably ship more than the 68,100 tons it did in 1952. Most Nevada ore is shipped to California for processing in the oil well drilling and chemical industries.

In Montana, a new plant came into production near Missoula, to treat ore from an underground operation.

Four new dry-grinding plants have been completed on the Gulf Coast to handle, principally, foreign ores. The product will go to the drilling industry. Plants are at New Orleans and Harvey, Louisiana, Brownsville and Corpus Christi, Texas.

Imports of crude barite probably exceeded 200,000 tons in 1953. Imports were 107,918 tons in 1952; 52,755 tons in 1951. Most of this material came from Canada, Yugoslavia, Mexico, Italy and Brazil. The tariff is $3.00 per long ton.

Usage. The drilling industry, which uses 65% of barite produced, requires a finely ground 325 mesh material. Weight is an important factor and most products have specific gravities ranging from 4.20 to 4.35. Primary function of barite in drilling is to provide weight for the drilling fluid to counteract high pressures encountered, and mud properties are an important quality factor.

High quality barite is required for paint and chemical industry where silica, iron and other impurities can be detrimental. Some barite is consumed by the rubber, paper and textile industries.

Within recent years, barite, mixed with cement, has found a new use as a pipe coating material in underwater transmission lines. Major plants are located at several Gulf Coast ports. Lately hematite has replaced barite to some extent.

A new use has been found in the mixture of finely-ground barite and latex, as an additive to asphaltic road surfacing material. A plant in Arkansas, completed in 1953, makes this product.

Trend. The most obvious trend in the barite picture today is increased imports. This is the source of practically all ore processed in the new dry-grinding plants in the Gulf Coast area. Whereas most domestic ores require beneficiation, most ores imported for the drilling industry require none. Importation of other grades of ore is centered chiefly on the Atlantic coast.

Increasingly high domestic freight rates are among the factors contributing to this trend toward increased imports•

Phosphate

- **Western Field continues expansion**
- **TVA phosphate research makes progress**
- **The U. S. is ready for increased consumption**

H. F. DENGLER
Export Sales Manager
International Minerals & Chemical Corp.

PHOSPHATE PRODUCTION in the U. S. reached an estimated 12.7-million tons in 1953 as compared to 12.1-million tons in 1952. Increase in output from the Western Field is largely responsible for the rise. Domestic consumption should be slightly over 1952's 9.9-million tons. World shipments should be about 24.5-million metric tons as compared to 23.8-million in 1952. Main supply areas are the U. S., North Africa, USSR, Pacific Islands and Egypt.

Phosphate Production in the U. S.

Thousands of long tons	1952	Estimated 1953
Florida Field	9,200	9,000
Western Field	1,400	2,000
Tennessee Field	1,500	1,700
Total	12,100	12,700

WESTERN PHOSPHATE FIELD[1]

Tonnage of phosphate rock and phosphate shale mined from the Western Field in 1953 totaled more than 2-million tons. Most of it went into the manufacture of elemental phosphorus.

Idaho continued in its role of production leader, with a total of 1,350,000 tons of phosphate rock and phosphatic shale mined and shipped.

Anaconda Mining Co. continued with its underground mining of phosphate rock. Development for surface operations within the same general location progressed very well, and from these workings both phosphate rock and phospatic shale were mined—all of which was designated for the Triple Superphosphate fertilizer market.

Phosphatic shale of this Western Field is too low in quality for fertilizer grade rock without benefication. Phosphatic shale, averaging plus 24% P_2O_5, has proved successful in manufacture of elemental phosphorus but the fertilizer industry uses only phosphate rock of plus 30% P_2O_5 by direct application to acidulation. Anaconda, in their experiments, have successfully beneficiated phosphatic shale of plus 25% P_2O_5, to standard fertilizer grade by chemical means. This is probably the first such large scale usage of western phosphatic shale.

San Francisco Chemical Co. at its Waterloo mine, resumed surface mining on a large scale and is opening new underground workings for immediate mining in 1954. During 1953 they mined and shipped approximately 80,000 tons.

Monsanto Chemical Co., newest in the area and now in its second year, mined approximately 250,000 tons of phosphatic shale from their holdings north of Soda Springs, all of which was shipped to their nearby plant for processing into elemental phosphorus. Monsanto is operating only one electric furnace, but recently announced that a second electric furnace will be completed by late fall in 1954. This should more than double annual tonnage requirements.

J. R. Simplot Co.'s Gay Mine realized its largest mining year. Both phosphate rock and phosphatic shale were mined and shipped from surface operations on the Fort Hall Indian Reservation. All phosphatic shale shipped, totaling 700,000 tons, was consigned to Westvaco Chemical Division, Food Machinery and Chemical Corp., near Pocatello. The Gay Mine also shipped over 50,000 tons of phosphate rock to their own plant near Pocatello, for Single and Triple Superphosphate fertilizers.

In addition to these operating companies, other organizations such as Central Farmer's Cooperative Association, near Georgetown, are developing surface and underground properties.

Wyoming was also an active producer as a result of San Francisco Chemical Co.'s holdings near Leefe. By surface means exclusively they mined and shipped approximately 220,000 tons of phosphate rock. It was shipped to Stauffer Chemical Co.'s Single Superphosphate plants in California and Washington, and into stockpile for the Western Phosphate Inc. at Garfield, Utah. Western Phosphates is constructing a Triple Superphosphate plant of 90,000 to 100,000 tons capacity per year. Production date is scheduled for early in 1954.

Production in Montana is confined to the Montana Phosphate Products Co. and to Victor Chemical Co. at Silver Bow. All mining in Montana has been by underground methods and geologic conditions point to its continuance.

Phosphate mining in Utah increased during the past year, and although the total output is still small, advancement is certain to be rapid in the near future. San Francisco Chemical Co.'s holdings near Randolph produced approximately 30,000 tons, and the J. R. Simplot leases in the same area produced approximately 16,000 tons of phosphate rock. The

[1] Supplied by L. M. Buhler, manager, Fertilizer Production Div., Simplot Fertilizer Co., Pocatello, Idaho.

Simplot output was used as a test mining and sampling program to formulate a larger schedule for 1954. Rock from this property was shipped to Pocatello, Idaho, Garrison, Mont., and to Consolidated Mining and Smelting at Trail, B. C., all for test purposes in manufacture of ammonium phosphate and Triple Superphosphate fertilizers, (Pocatello and Trail, B. C.) and the production of elemental phosphorus (Garrison, Mont.).

Leaders of this industry, so new to the west, foresee further expansions far exceeding the total production of 1953. There is no leveling-off period in sight. Though still experiencing "growing pains" of rapid advancement, it has now been firmly established that the mining and processing of phosphate rock and phosphatic shale from this Western Field is definitely assured of a sound future.

TENNESSEE

Estimate of 1953 Tennessee production is about 1.7-million tons, which is somewhat higher than the 1952 tonnage.

Activities continue in patterns established in the last decade when the depletion of high grade deposits put emphasis on the lower grades in the phosphorus furnace and on direct application rock. Because of this reserve position no large scale new mining installations can be expected, but new uses assure existing mining companies of continued operations. In consequence, mines are being modernized and well maintained. For example, Virginia-Carolina Chemical Corp. reports that their Mt. Pleasant washer flowsheet has been revised to include additional equipment, with a marked increase in efficiency and improvement in grade of product. With liberalization of the Tennessee truck weight law, which permits maximum gross vehicle weight to increase from 42,000 lb to 55,580 lb some operations are changing from smaller gasoline-operated trucks to Diesel-powered units.

Formation of M. C. Boyle Phosphate Co. in Hickman County, Tenn. was announced in the early fall. A drying and grinding plant at Toomey, scheduled for completion in early 1954 will have a capacity of 60,000 tons a year of ground rock for direct application to the soil.

Ever since its inception the TVA has been active in phosphate research and development. The following are highlights of its work in 1953.[2]

Raw phosphate matrix from Tennessee and phosphate pebble from Florida are mixed at the TVA plant to make low-cost electric phosphorus furnace charge. Mixed phosphates are fed to a 10x80-ft. kiln where they are blended and partially dried. Discharged material is agglomerated in nodulizing kilns.

Phosphate sand and matrix were agglomerated by pelletizing and calcining. The process consists of mulling sand or pebble with matrix in a wet pan, pelletizing in a rotating cylinder, and calcining in a vertical shaft kiln. Operation of the pelletizing equipment was improved and the production rate increased, but not enough to equal the capacity of the shaft kiln. Tests showed that the kiln operated better with phosphate briquets than with pellets. As briquetting is cheaper than pelletizing and can be used with a wider range of materials, it is planned to replace the pelletizing equipment with briquetting equipment.

Two fused tricalcium phosphate furnaces near Columbia, Tenn. have been operated with new types of hearths to withstand corrosion by molten rock phosphate and furnace gases. One furnace is equipped with a graphite hearth, and other with a copper hearth. Both have resisted corrosion satisfactorily and are superior to previous types.

Expanded slag from TVA's electric phosphorus furnaces is in considerable demand. Concrete block makers have found it suitable for making lightweight blocks. Plans are being made to install an expansion unit for processing slag from two of the TVA furnaces.

Calcium metaphosphate fertilizer production was increased from 3000 to 5000 tons per month by improvements in the equipment and operation. Most important change was in lining the phosphorus combustion chamber. It was found that the refractory lining was not needed because a protective layer of solidified metaphosphate formed inside the watercooled shell. The layer is held by a gridwork of iron rods welded to the shell.

Ammoniation of superphosphates and fertilizer mixtures was studied by TVA in a cooperative program with the National Fertilizer Association. The work led to development of a novel continuous ammoniator in which mixtures are ammoniated to a greater extent than with usual types of equipment.

Other fertilizer research by TVA included pilot-plant studies of production of diammonium phosphate from wet-process phosphoric acid, development of processes for the production of nitric phosphate fertilizer from leached-zinc phosphates of Florida, and studies of the production of a highly concentrated fertilizer from phosphorus and ammonia.

FLORIDA

Florida operations continue to be the largest and most important not only in the U. S. but in the world. During 1953 9-million tons of finished product are estimated to be the output of the 7 companies.

American Agricultural Chemical Co. have now in operation a 40-ton Kennedy-Van Saun Ball Mill for grinding of phosphate rock with an annual capacity of 240,000 tons. They are improving drying plant facilities. A new 650-B dragline should be in operation early in 1954.

American Cyanamid Co. has increased mining capacity with addition of a 500-W Bucyrus-Erie dragline, and remodeling of the Sydney flotation plant to handle more feed.

Davison Chemical Corp. initiated an exploratory program of land improvement, close to the city limits of Lakeland. One parcel of swampy land, which the company owns but which has been eliminated from the areas to be mined, is being drained and graded so that it will be suitable for home building. In areas which are being mined, south of Lakeland, lakes will be created, land leveled and filled with tailings from processing operations.

Construction was virtually completed of a $12-million triple Superphosphate plant near Bartow, to be on stream early in 1954. The plant utilizes the Dorr process, and a lower grade of rock will be processed than is practical

(Continued on page 138)

[2] Supplied by Mr. J. H. Walthall, director, Division of Chemical Development, Tennessee Valley Authority, Wilson Dam, Ala.

Asbestos — IN SHORT TONS,

1952

From	Crude Incl. Blue Fiber Tons	Crude Incl. Blue Fiber Value	Mill Fiber Tons	Mill Fiber Value	Short Fiber Tons	Short Fiber Value	Total Tons	Total Value
Australia....	274	83,353	—	—	—	—	274	83,353
Bolivia.....	412	157,289	—	—	—	—	413	157,289
Canada.....	555	393,398	210,293	30,852,323	458,012	22,243,941	668,860	53,489,662
Italy.....	—	—	11	12,721	—	—	11	12,721
Portugal.....	16	1,323	—	—	32	3,584	48	4,907
South. Br. Africa.....	607	164,368	—	—	—	—	607	164,368
So. Rhodesia.	10,121	3,385,933	422	178,763	—	—	10,543	3,564,696
Un. S. Afr. ..	26,640	3,861,619	152	33,611	100	12,699	26,892	3,907,929
Un. Kingdom	—	—	—	—	5	1,815	5	1,815
Venezuela...	—	—	5	2,234	—	—	5	2,234
U.S.S.R.....	—	—	1,761	206,926	—	—	1,761	206,926
Totals ..	38,626	8,047,283	212,644	31,286,578	458,149	22,262,039	709,419	61,595,900

Asbestos

- **Asbestos shipment drop in second half of 1953 considered temporary.**
- **Heavy Russian offerings may affect "Free-World" markets.**
- **1954 will see start of new large asbestos production facilities.**

WALTER A. RUKEYSER
Consulting Engineer, New York, N. Y.

AS OF THE END of last July total shipments of all grades of asbestos from Canada compared favorably with the same period of the past year—531,553 vs. 529,531 for 1952. However nearly 14,000 tons less of the spinning, shingle and paper grades were shipped from the Quebec mills while some 13,000 tons more of the shorts were sent to consumers. By the end of October a marked deterioration in the Canadian sales picture became evident. For that month alone a decrease in shipments from 89,405 tons in 1952 to 80,713 for 1953 was reported. Of this decrease Groups 3, 4, and 5 fibers from Quebec accounted for 4,800 tons, shorts for 4,700. (See table of Canadian Shipments for 10-month period, 1952 vs. 1953)

At the 1952 median fiber price of a little over $95 per short ton, the tabulated figures represent a $1-million per month reduction in gross revenue for September and October of 1953 as compared with 1952. The final two months of 1953 will probably show no reversal in sales trend. Accordingly shipments for 1953 are estimated at a total of 880- to 890,000 tons having a total value of $84- to $85-million. Ratio of shorts production to total Quebec reached almost 66%.

Canada retained for its own uses about 38,000 tons for the first 10 months of 1952 as opposed to 37,000 tons for the same 1953 period. Decrease in shipments is therefore accounted for by lesser exports.

The following factors, some of which may continue to affect Canadian industry adversely in 1954, account for this change: (1) Cessation of hostilities in Korea. This was probably reflected by NPA's order on Mar. 31 amending Order M-96 to remove limitations on the use of less chrysotile spinning grades and then, on May 12, revoking the order entirely—indicating that an adequate stockpile had been acquired. (2) Production in all other producing areas has been increased. (3) Desperate buyers in Europe found themselves overstocked, and offered surpluses for sale, especially in "hard-money" countries. This applies especially to Groups 3 and 4 material. One of the world's largest users of these grades in Europe and South America believes that a buyer's market will continue for 18 to 24 months.

The situation may be further aggravated by the end of 1954 by completion of additional produc-

U.S. Imports

VALUE IN DOLLARS

From	First Nine Months 1953 Crude, Incl. Blue Fiber Tons	Short Grades Tons	Total Tons
Australia	964	2	966
Bolivia	354	—	354
Canada	717	483,248	483,965
Italy	1	—	1
Portugal	6	—	6
South Br. Africa	19,572	—	19,572
So. Rhodesia	7,013	—	7,013
Un. S. Afr.	24,461	193	24,654
Un. Kingdom	—	—	—
Venezuela	—	—	—
U.S.S.R.	108	217	325
Total	53,196	483,660	536,856

Asbestos in Canada

Estimated Operating Costs

Labor	$23,700,000
Supplies	6,000,000
Fuel and Power	3,300,000
Bags	4,000,000
Taxes (All)	14,500,000
Replacement (Plant etc.)	6,500,000
Compensation, Silicosis and Unemployment Ins.	500,000
Total	$58,500,000
Gross Income (Est)	$85,000,000

For 13-million tons of ore mined with some 7% plus recovery, the place value for the Canadian deposits as a whole is about $6.50 per ton, and the direct cost of mining and milling, $4.50.

Asbestos Shipments, 10-Month Period*

	1952	1953
Quebec		
Crudes	617	601
Spinning, shingle and paper stocks	274,280	251,263
Shorts, etc.	487,585	487,657
Total	762,482	739,521
Canada	781,581	762,862

*Dominion Bureau of Statistics Report

tion facilities in Canada, and by increasing asbestos offerings from Russia. Statistical sources have grossly underrated USSR production. An emigré Russian engineer who has had access to Fersman's "Geochemico-1953" quotes Russian production by Uralasbest in the Urals and Caucasia as 800,000 tons produced from some 20-million tons of rock. Much of this output is said to have gone to China, and increasing amounts are being offered to Europe and South America. This can have great impact on "Free-World" markets.

WORLD NEWS IN BRIEF

Canada. Rock mined and milled will probably be the same in 1953 as in 1952, namely 13-million and 11-million tons, respectively Although shipments will have been less, production of fiber should be about the same—near 1952's 937,-851 tons. A breakdown of costs and estimated gross income are shown in an accompanying table.

Johns-Manville with its approximate half-million ton output still leads as the world's largest individual producer. Asbestos Corp. accounts for about another quarter-million tons.

In Thetford Mines, Quebec Central Railway's main line located directly over the King-Johnson-Bell open cuts will be relocated. This is the start of a significant long-range cooperative program by these three companies to permit block-caving expansion in the future.

Equally important is the recent announcement by Lake Asbestos of Quebec, Ltd., subsidiary of American Smelting & Refining Co., that an order-in-council has been passed permitting the draining of Black Lake, under which its orebodies lie. Plans and specifications for this program have been filed with the Quebec government. Maximum water depth is said to be about 30 ft, and maximum silt depth, 270 ft. It is planned to bring this property into production at a rate of 5,000 tons of rock daily, and at a total cost of some $15-million.

Johnson's new 4,000-ton mill should start production early in 1954. Dominion's new 100-ton-per-hour plant started production last summer. Asbestos Corp.'s new Normandie mill should go into production later this year, an additional sum of $2-million having been set aside to meet increasing construction costs. Bell-Asbestos Mines Ltd., (Turner-Newall) have completed the change-over from open-pit mining to block caving.

The first section of Johns-Manville's new plant at Asbestos, Que., is scheduled for completion in 1954. J-M has also purchased a new property in Reeves Twp., Ontario, in the same general area as J-M's Munro mine and mill.

In the J-M-Nicolet-Dominion section of Quebec, Flintkote is developing a promising prospect, but on the whole exploration by non-captive companies is slowing down appreciably.

In British Columbia, Cassiar Asbestos Corp., Ltd., started its mill on schedule on July 1. After a two-weeks tune-up period, the plant produced 63.9 tons of 3-K fiber and 75.8 tons of 4-K, operating only one shift per day during a 14-day period. This resulted from processing 1,897 tons of ore (135 tons per shift). Recovery was 7.38% of these two grades from 60% of the mill feed comprising minus 1-in ore. Oversize is being stockpiled. The talus-slope mine, operated by three bulldozers, produced at a rate of 1,000 tons per day, for stockpile at the mill. The mill went on two-shifts in August. Crushing plant, drier installation, and 40,000-ton dry-rock storage and townsite were completed last fall. Cassiar may thus add 10- to 20% to the total output of Canadian spinning fiber.

United States. Rubberoid's mill in Vermont continues at its 2400-ton a day capacity and provides most of the country's approximate 55,000-ton production. Accompanying tables prepared by Dr. Oliver Bowles and F. B. Mentch of the U. S. Bureau of Mines give the important statistics of American

(Continued on page 133)

Domestic Mica—Government Purchases

(through November)	Lb. Estimated	Price	Value
Spruce Pine, N.C.	102,379	13.49	$1,381,093
Custer, S. Dak.	21,573	9.00	194,157
Franklin, N.H.	15,516	12.47	193,484
Total or average	139,468	12.68	$1,768,734

Mica Imports 1953

	Lb. (estimated)	Change from 1952
Muscovite block	4,300,000	+19%
Muscovite film	403,000	+33%
Muscovite splittings	7,700,000	+14%
Phlogopite splittings	770,000	+14%

Mica

WALDEMAR F. DIETRICH, Chief
Ceramic and Fertilizer
Materials Branch
Bureau of Mines

REVIEW

ALL MAJOR DIVISIONS of the mica industry were more active in 1953 than in 1952. Increases were recorded in imports of muscovite block, film and splittings (see table), in domestic production of muscovite block, and in sales of scrap mica.

Imports of muscovite block mica came principally from Brazil (53%) and India (44%). Muscovite film and splittings were almost entirely from India, while phlogopite was chiefly from Madagascar.

Government buying of strategic mica was extended until June 30, 1957, by a General Services Administration announcement in July, and non-ruby mica was included in the program. From Oct. 5 through Nov. 23, 35,005 lb were purchased for $38,134 at the buying depot at Spruce Pine, N. C. Purchases of ruby mica are shown in the accompanying table above.

Demand for muscovite film mica (mostly for capacitors) and for stained and better qualities of muscovite block for electronic uses was at a high level all year. Supply of lower than stained muscovite block was plentiful.

Demand for ground mica was excellent and the supply of scrap was ample in major producing areas. Sales of wet ground mica are estimated at 6% less than in 1952, but dry ground sales should show a substantial increase. There was little change in quoted prices for scrap and ground mica, but there was a softening of the scrap market in North Carolina.

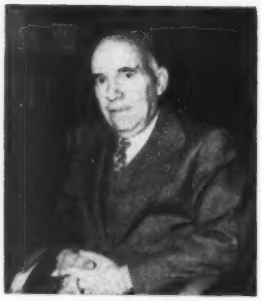
KEY DEVELOPMENTS

Since the first DMEA contract for mica exploration in July 1951, 116 exploration contracts had been executed through November 1953. Some 63 contracts have been concluded, of which 11 were certified as discoveries or development.

Reconstituted mica paper was produced from scrap mica at the Samica Corp.'s new plant at Rut-

(Continued on page 133)

Feldspar



BROOKE L. GUNSALLUS
Commodity-Industry Analyst
Bureau of Mines

MODERNIZATION OF MINE AND PLANT facilities, a large increase in the proportion of feldspar obtained by wet rotation, and higher prices for the finished product were the noteworthy features of the feldspar industry in 1953.

Modernization: Bell Minerals Corp. purchased the West Paris, Me., operations of the United Feldspar & Minerals Corp. Hand labor in the mine and mill was eliminated by mechanical loaders. A program of rehabilitation was instituted throughout the plant, and production capacity increased.

After an extensive diamond drilling program to determine ore reserves, International Minerals & Chemical Corp. (Consolidated Feldspar Dept.) planned a feldspar mill in southern Connecticut. The mill will use a dry beneficiation process and the output will be sizeable. The company also modernized and improved its plants in North Carolina and Tennessee.

(Continued on p. 133)

SURVEY OF MINING PRACTICE

A. H. HUBBELL
Senior Associate Editor

Tungsten Carbide Holds Its Lead

Tungsten carbide drilling holds its lead, with detachable bits still well ahead of carbide-tipped forged steel in acceptance. Single-use bits remain widely popular. Multiple-use steel bit continues in the picture.

WIDENING ACCEPTANCE of tungsten-carbide drilling is indicated by our Survey. The situation respecting the single-use, or throwaway, type of steel bit is obscured by the changes in ownership and manufacture that have been taking place in the last twelve months. In any case this type of bit is still very popular in many quarters, and consumption is on the order of many millions annually. Efforts to economize by getting more than one use out of this type have cut the total used per year considerably. Multiple-use steel bits are still in the picture. They have a promising future, according to one authority.

Of the two carbide drilling media in use, the detachable insert bit appears to be at least holding the lead it has had over tipped forged steel. A drawback with the latter is that many users discard it and let it accumulate when the inserts are worn out, even though considerable life remains in the rod. This presents the, as yet unsolved, problem of devising a product for which bit life and rod life are approximately equal.

A NEW ALLOY DRILL STEEL

Experts Collaborate. Promising still better results with detachable carbide bits is the introduction currently of a new and improved alloy hollow-drill steel. Designated as "EEEE," this steel has been developed by the Crucible Steel Co. to meet physical specifications of Ingersoll-Rand's metallurgical department written after extensive laboratory and field research, including a study of latest drilling techniques that use carbide bits. The specifications are thought to demand the maximum in a hollow drill rod. The steel is said to require no change in heat treatment from that used for the present chrome-moly type but to have wider latitude in heat treatment, so that it will not have to be separated at mines that have been using the chrome-moly type.

AIR-LEG WELL ENTRENCHED

Drills for Air-legs. This type of drilling, using tipped steel or detachable carbide bits, is unquestionably popular. Gardner-Denver recently introduced two of its proven drills, one of 2½-in. bore and the other of 2⅝-in. and equipped each with a 4-ft. feed leg, for this purpose. The former weighs 79 lb and the latter 87 lb, leg included. The feed travel built into the machine can be increased by a detachable feed leg extension. These units are intended for stoping, driving small sublevels and drifts, slashing jobs, cutting stations, or development.

Air-leg Drilling Progresses in Eastern U.S. J. J. Daly, general manager for Copco Eastern Ltd., Paterson, N. J., representative of Atlas Diesel drills and Coromant tipped steel, writes:

"Acceptance of air-leg drilling has continued to expand at a relatively rapid rate. New progress has been notable at mines in the Tri-State, S. E. Missouri, eastern Tennessee, New Jersey, and Pennsylvania. Some successful applications have been found in mines where only highly mechanized drilling equipment has been thought practical. Points favoring use of air-legs were: greater flexibility and mobility, particularly in irregular orebodies, increased footages per man-shift, elimination of drilling delays due to failure of mechanical equipment, lower initial cost and favorable maintenance costs.

"The expanding acceptance of air-leg drilling has been aided by the improved models of rock drill and leg combinations placed on the market by drill manufacturers. The new models are aimed at giving higher drilling rates through improved designs, at providing an integrated and balanced drilling unit, and at gaining acceptance with labor through limiting weights, better grouping of controls, and greater ease of operation.

"Use of carbide-tipped steel with air-leg units and, in some cases, with other types of drills, also has expanded rapidly. Use of such steels was not confined to air-legs of foreign make; in instances, this type of steel of Swedish manufacture, is being used effectively with American air-leg drills. In several cases integral-bit Swedish steel is in use with rock drills on jumbos in mechanized mining.

"The newest application of the air-leg drill has been in the underground exploratory drilling. Here the air-leg combination has been used with ⅞-in. hexagonal extension drill rods to drill exploration and sampling holes to horizontal depths of over 100 ft and vertical depths of over 50 ft. Diamond drill equipment has been replaced in a number of eastern mines.

"During the six months testing has been in progress with the object of making further reduction in the diameter of drill holes. This

work involves the use of a ¾-in. hexagonal drill rod with integral tungsten carbide bits averaging about 1 in. in diameter."

Drilling Complexities. Despite the varied drilling means and procedures in use, no general purpose mode of drilling is even in sight. Drilling conditions vary greatly. The situation has become more complex, rather than less, as the average operator, searching for tools and methods best suited to his ground, shows a willingness to give anything a trial that has been helpful elsewhere.

LET THE MANUFACTURER SPEAK

Multi-use Steel Bit Returning to Favor. J. B. Baker, Timken Roller Bearing Co.'s chief products engineer, says:

"The use of carbide-insert rock bits has increased appreciably. Best of all, the multi-use steel bit is coming back into favor. The increase in both cases has not been at the expense of either. With proper reconditioning the multi-use bit can prove the most economical and is finding new uses. One of these is roof-pinning, the selection here being in the smaller sizes. . . .

"The carbide-insert bit is continuing in development, both in carbide make-up and in bit design. Carbide manufacturers are alert . . . . many are conducting extensive development programs . . . . we expect results within the next year or so. Several are making interesting claims. Timken, in particular, has entered into a very extensive, expensive and far-reaching test program which we expect will answer many of the questions being asked by rock bit users, carbide makers, and bit manufacturers and designers.

"An interesting development is that of the larger bit sizes. Certain individuals are talking in terms of carbide insert percussion bits of 5-, 6-, 8- and 10-in. gage. Whether these will be economical or even possible with present equipment and technique will be studied . . . .

"Use of carbide bits in long-hole drilling is increasing. . . . Several companies have developed satisfactory couplings and an interesting technique is resulting. Timken is involved in this through its insert bits and its couplings. . . .

"Appreciation is growing of the value of the shouldered connection between steel and rock bits. Many are learning of its advantage and the value resulting through interchangeability of many different types and gages of bits on the same steel. Anyone is now free to use the Timken thread, the patents having expired. We hope that advantage will be taken of this, resulting in eventual standardization and simplification of threading tools, dies and gages.

"Our impression is that the overall use of tipped steel is decreasing. . . . The advantages claimed have not been able to overcome the advantages of removable bit construction.

"The question of hollow-drill steel continues tender. Properties using carbon drill steel express satisfaction, likewise those using alloy hollow drill steel. Our rock bit works equally well with both.

"A substantial but not phenomenal growth in the rock bit business is anticipated in 1954."

WHICH WAY THE THROW-AWAY BIT?

Changes Mark Single-Use Field. Not so long ago Timken dropped its single-use bit, finding that it is not economically competitive with the multi-use bit (which Timken makes) and cannot be used where the carbide bit is necessary.

Calumet & Hecla stopped manufacturing the Liddicoat single-use bit on Dec. 31, 1953. It believes there will always be a place for the single-use type, but, because of local conditions and a changeover in type of C. & H.'s underground equipment, reduction in use of this type of bit precludes their making it. (C. & H. has been intensively testing air-leg equipment for over a year).

Thompson Products Ltd., St. Catharines, Ont., owner of the Liddicoat single-use bit, will make, sell and distribute it in what has been C. & H.'s territory.

E. R. Bartlett, manager of Thompson Products' mining division, anticipates a good year for their steel bit, believes that while the steel bit market has been depressed due to use of carbide, the bit will gradually regain some of its lost prominence. The trend, he says, is to smaller holes with bits of smaller gage. This presents a problem to those making detachable bits, but tests indicate it will be overcome. No design changes have been made but some required gage sizes were added.

Western Rock Bit Mfg. Co., Salt Lake City, makes the Liddicoat bit for 11 western states, Alaska, Hawaii, Philippines and Mexico. Horace Siegel, general manager, asserts the two most popular bits now used are the Liddicoat "use to destruction and then discarded" steel bit and the Liddicoat Tee Cee carbide bit. Use of the former single-use type, he says, is growing constantly.

LIVELY DOINGS IN P.M. BITS

The P. M. Single-Use Bit. G. H. Cave, of Rip Bits Ltd., Sheffield, England, states they are still selling large quantities of the P. M. single-use bit. "While several collieries in Great Britain have stopped using carbide bits for development work in favor of P. M. bits, we have not noticed any definite trend towards re-instatement of single-use bits."

CARBIDE FOR THE P.M. BIT

P. M. bits are now being tipped with small tungsten-carbide inserts. A feature is the small segment of carbide which allows the selling price to be very low (22/6d.). The bit is intended chiefly for drilling in Sandstone measures in Britain, under which conditions it drills 200-300 ft, representing a drilling cost for bit alone of under 1½d per foot. The heavier types of carbide bit, such as Rip Bits' Riploy bit, would have to drill 800-1000 ft to produce such low costs per ft.

Three-Wing Riploy Bit. Rip Bits Ltd. has found that when drilling with 4-pt cross bits there is little clearance for cuttings when bit diameter is close to base diameter, so, to overcome this difficulty, it has added a 3-wing bit to its carbide-bit line. This has a wider sludging groove, and, in the 1⅜-in., 1½-in., and 1⅝-in. diameters in which it is made, drills faster and often farther than 4-pt cross bits of similar size. It can be used in broken ground when single chisel bits will not drill successfully. It is also easier to grind because of the greater distance between the cutting wings.

For Coupled Rods a Modified Thread. Previously Rip Bits' coupled rods were screwed 6 threads per in., but the pitch has now been increased to 2 threads per in., which gives greater strength to the rods and couplings. Uncoupling is

also much easier and there is no need for spanner flats. The coupled rods are being made in ⅞-in. and 1-in. hexagon sections and in 1¼-in. round sections. Water swivel heads can be had for external air or water infusion. Sales of coupled rods to mines are steadily increasing, indicating the trend of long-hole drilling.

HAYES P.M. BITS FOR U.S. MINES

LeRoi To Make Hayes P. M. Bits. Cleveland Rock Drill Division of LeRoi Company, is manufacturing Hayes P. M. bits under license from Hayes Steel Products Limited, Merritton, Ont., which has been making the P.M. bits in a modified design[1] in Canada. The LeRoi Cleveland bit will be known as the CRD one-use detachable bit. As part of its agreement with LeRoi, Hayes will sell and distribute Cleveland rock drills in Canada.

The necessary production equipment for making the bits was secured by LeRoi last July when it acquired the entire manufacturing facilities of Drill Bit & Tool Co., Midland, Pa. (owned by MacIntosh-Hemphill Co. of Pittsburgh) which had set out in 1952 to make the Throwaway bit. LeRoi has made many improvements and refinements in this machinery. First production of bits began early in August.

The CRD one-use bit is intended for hard-rock mining, coal roof-bolting practices and general construction drilling. Two styles are available: the ⅞ series for ⅞-in. drill rods in sizes from 1¼ to 1⅝-in. by 1/16-in. increments, and the 1-in. series, for 1-in. steel and round lugged steel, in sizes from 1 7/16 to 2¼ in. by 1/16-in. increments.

The Hayes company, according to R. J. Letourneau, believes that more mines are turning to a steel bit, such as its P. M. bit, for the light airleg machines. Strike conditions have hampered observations.

Experiments With Craig Bit. Joy Mfg. Co. (Canada) Limited now has the well-known Craig single-use steel bit. In cooperation with some of the largest mines in Canada, it has been experimenting with slightly different faces for this bit, according to J. A. Drain, president. These operators feel that one-pass steel bits are more economical than tungsten-carbide drilling under their ground conditions, even though they are using smaller drills on air-legs. There appears to be a break-off point in the hardness of ground where the one-pass bit wins out.

At the same time, the Craig line includes both chisel-type and 4-pt carbide-tipped forged steels which have been widely accepted in Canada.

A Carbide Bit for Reaming. Joy in Canada also has developed the Dimitrieff tungsten-carbide 4-pt bit, designed for reaming cut holes in drifting and raising. A pilot nut which screws on the end of the steel, threaded for 1 in., after the bit has been slipped on, keeps the bit on the shank and follows the path of the bore hole being reamed out. This is used with all types of air-leg drills and comes in sizes of 2¼, 2½ and 3 in. The skirt will fit ⅞-in. and 1-in. hex. or QO steels.

WHAT THE OPERATOR SAYS

About Bits, Drills and Practice. Recent developments underground in drilling practice are summarized briefly in the following. So complex has the practice become, in that most operators are using several kinds of drilling, no effort has been made to classify these items according to the kind of drilling.

Space limitations, moreover, prevent use of many communications:

International Nickel. Five air-leg drills on a specially designed drill carriage were used in a high-speed drifting operation to connect No. 2 Shaft with the new No. 3 Shaft on 2650 level at Inco's Levack mine. The big drift, 11 ft wide by 12 ft high and 3,000 ft long, will service the new eastern mining area now being developed below 1600 level. Using carbide-tipped chisel-bit steel, crews on the job averaged better than 380 ft of advance per month. Mucking was done with the largest mechanical loader yet used underground by Inco, loading one 110-cu ft car every two minutes.

Since about 40% of Inco's ore comes from blasthole stopes, blasthole drilling continued to be a subject of constant study and investigation. During 1953 an average of 131,000 ft of such drilling was done per month, 79% of it by percussion drills with carbide bits and the balance by conventional diamond drilling.

In the past year the size of percussion blastholes has been increased from 1⅞ in. to 2⅛ in. in Inco's mines, thereby increasing by 36% the volume of powder that can be loaded per hole. Heavier machines of various makes to handle larger bits are either being designed or are under actual test. The same trend toward larger holes follows in diamond drilling. Larger holes and drills have led to further study of drill rods and coupling sections, and pose the possibility of couplings being eliminated in favor of some form of large flush-joint tubular rods.

A Company in British Columbia. Chisel-type carbide-tipped rods are being made locally for air-leg work. Atlas Nushank steel is used and inserts are brazed with silver solder by an oxy-acetylene welding ring of 2½ in. inside diameter. Cost is about half that of rods bought from manufacturers with equal performance. For long-hole drilling, 2⅛-in. 4-wing, carbide-tipped rods are being made in 24-in. lengths, with thread on one end and bit forged on other. A 3½-in. ring is used. This work is in the experimental stage. Brazing procedure is simple and equipment costs reasonable.

In some soft ground, steel bits with ⅞-in. hexagonal rods are used to advantage with air-leg equipment.

Limited tests of the Holman Dryductor as a stoper application indicates merit in respect to dust count, which was reduced about 80% below that of a standard stoper. Equipment is bulky and would require special conditions for use.

Belleterre Quebec Mines Ltd. J. K. Godin, manager, says he has had considerable success in resharpening the P. M. detachable bit, which is designed originally as a one-use bit. Use of detachable carbide bits has been discontinued in favor of Coromant chisel-type tipped forged steel.

New Senator-Rouyn Ltd., Quebec. Use of 2⅛-in. Craig steel bit to ream cut holes has helped pull the cut in 8-ft and 10-ft rounds. Company has also tested carbide-tipped forged steel in ¾-in. rods, necessitating use of ⅞-in. powder. Drift men have shown prejudice against the smaller powder.

American Smelting & Refining Co., Mexico. Use of light-weight rock

[1] Hayes Steel Products Limited states that the Hayes P.M. bits are a modified design of the P.M. bit made by Rip Bits Ltd. Heavier construction is used, incorporating offset gage. The socket connection is the only feature that is comparable.

drills and tungsten carbide is still expanding as a gradual change in normal operations.

Pamour Porcupine Mines, Ltd., Ontario. D. E. G. Schmitt, mine manager, says they are using more detachable carbide bits of the XL type, made by Canadian Ingersoll-Rand—mainly on the light JR 38 CIR stopers in raising.

Sigma Mines, Quebec. J. B. Redpath, manager, is reaming cut holes in drifts with air-leg machine using 2⅜-in. detachable 4-wing carbide bit. Bit is attached by simple taper to ⅞-in. hex steel (discharged Swedish steel), cushioned by a soft metal shim. Use of this cut hole is being expanded into raises.

Tests are in progress on 1¼-in., 4-wing carbide bits of various push-on types in search of a suitable bit to replace steel bits used in raises.

Retipping Swedish chisel-type carbide-insert forged steel at least twice is general practice for Sigma Mines, giving lower drilling costs. A third retipping may break the bar.

Swedish carbide-tipped flexible steel, of rectangular cross section and of lengths up to 24 ft (can be had up to 31½ ft), are under test as an alternative to long-hole drilling with coupled rods.

Mining Company, Ohio, has changed to alloy steel rods on long hole drilling. It has also built two drill jumbos on heavy diesel trucks, using four hydraulically controlled jibs, with vertical and horizontal movements on each jib to position drills.

Triumph Mining Co., Idaho, has increased its use of carbide drilling, including detachable insert bits and tipped steel to practically 100%.

Hollinger Consolidated Gold Mines, Ontario. Use of steel bits will be dropped gradually. Detachable carbide bits will be used for all blast-hole drilling when replacement has been completed of all machines not suitable to their use. Considerable success has been had in rebuilding bits, using good inserts from damaged bits to replace damaged inserts in otherwise undamaged bits.

Canadian Refractories Ltd., Quebec, W. T. Bray, mine manager, is using detachable carbide bits in development headings and shaft sinking in hard quartz-monzonite in the footwall. In carbonates of the ore zone it continues to use single-use Liddicoat bits. In hard ground, 2-in. QO steel is being used with carbide bits in stopers and drifters.

One 3-in. drifter is being used experimentally with coupled rods and carbide bits for blast holes. So far this practice has not been able to beat the cost of using small diamond-drill blastholes (1¼ in.) where normal footage per shift is 250.

Howe Sound Co., Chelan Div., Wash. John J. Curzon, manager, extended its use of Jackdrills with 1⅜-in. carbide bits and ⅞-in. alloy drill steel, following tests late in 1952. Some success was had so long as men could be kept trained to use the new type of equipment. Use of it is now limited to isolated places that are hard to service.

A Company in Sudbury District, Ont., now using tipped forged steel, has made two tests with 1¼-in. detachable carbide bits with encouraging results. A production test is under way. Use of a detachable bit would allow simple control over careless handling and thus become a "dollar saving."

An Ontario Gold Mining Company has replaced detachable steel bits in drifts and sill drifts with carbide-tipped forged steel. It is now making and experimenting with its own 4-wing carbide-tipped steel with an apparent substantial cost cut compared with buying from suppliers.

An Iron Mining Company in Ontario is starting to retip in its own shops the worn-out carbide-tipped forged steel initially bought from suppliers. As a result, all mine drilling is now standardized, using tipped steel only, and overall development cost is less because of shorter drilling cycle.

During the past 12 months, with the aid of a rod-holder developed by drillers and made in its shop from scrap, blasthole drilling has been extended by this company to the economic drilling of upholes 70 ft long at any dip.

AS & R Co., Idaho. Pusher-leg type drills have shown improved results over drifters in stopes when breasting down.

U.S. Smelting, Salt Lake City. Jackhammers used with air-legs and drilling with ⅞-in. hex steel and small bits, continue to replace Leyner-type machines using 1¼-in. round, lugged steel and 1-in. QO steel with a straight shank.

Homestake Mining Co., South Dakota, has completed its changeover to detachable carbide bits. All stopes use air-legs and 1⅜-in. bits. Drifts and raises use 1⅝-in. bits. Flexible Copco drill rods are being used for drilling 21-ft test holes from a 7x7-ft drift, according to C. N. Kravig, mine superintendent.

A Mining Company in Northeastern Tennessee is making greater use of air-legs, with substantial savings in labor.

American Zinc Co. of Tennessee. According to M. J. Langley, superintendent of mines, they are experimenting with ¾-in. hexagonal drill steel having carbide inserts and are getting good results with a drill of 38-lb class and an air-leg. Penetration has been increased 20% with no increase in steel breakage, as compared with ⅞-in. hexagonal steel, 48-lb drill and air-leg.

Old mined areas are being prospected to vertical 40 ft depth, roof and bottom, with coupled rods, 48-lb drill and air-leg. A detachable carbide chisel bit developed by Copco Eastern is used. Price per foot, compared with that of diamond drilling, has been reduced by $1.

Powell Rouyn Gold Mining Co., Quebec, is changing from tipped forged steel to 4-wing detachable insert bits made by Gardner Steel Co. (local). This bit sells for 30% less than most bits. Grinding will be done on surface under better control and is expected to improve. Costs should be lower, drilling faster (using a smaller starter) and gage loss less.

Copper Company, Northern Rhodesia. Present standard B diamond rod equipment is being replaced by 2-ft Acme tapered-thread rods, with every fifth rod having an oversized fixed stabilizer coupling fitted with carbide inserts. Better drilling efficiencies have resulted due to the Acme taper's advantage of quick coupling and uncoupling. Rod vibration has decreased markedly due to the stabilizers.

The NX size hole has been extended to stope slot drilling, giving better efficiencies.

Cleveland-Cliffs Iron Co., Ishpeming, Mich., is getting the following advantages with rotary drilling of long holes over percussion drilling: twice the drilling speed, set-up time and maintenance less, water not required, and rod breakage practically nothing.

A Fluorspar Mining Company, at Rosiclare, Ill., is drilling 20 to 25-ft holes with coupled rods to check

walls of vein for possible splits.

Iron Mining Company, New York, is using carbide bits 100% for mine drilling. Most stopes are equipped with coupled rods and carbide insert bits for long-hole drilling.

O'okiep Copper Co., South Africa. J. M. MacLeod, resident manager, says all mines have gone over to carbide-tipped steel 100% for development and for stoping (long blast-hole drilling with coupled rods). The combination of air-leg, 2⅜-in. jackhammer, and carbide-tipped steel is ideal and very popular with operating personnel.

Zinc Mine, New York State. Use of detachable carbide bits has made it possible to convert to long-hole drilling with coupled rods in the larger stopes. This has increased production by eliminating delays to muck off benches and scale down side walls. Fragmentation is also better.

International Salt Co., Detroit, has decided on the multiple-use steel bit as best for its operations, this after long use and experimentation with single-use and multiple-use steel bits and detachable carbide bits.

Underground Iron Mine, Cuyuna Range, Minn. is using multiple-use steel bits in mining places, carbide-insert bits in shaft sinking and drifting in rock, and coupled rods in stopes, drilling 25-ft holes.

Iron Mining Company, Birmingham, finds that a large diameter (8 in.) rotary drill, for "reliever" in burn cuts, makes 12-16 ft advance per round practicable, with excellent fragmentation, as against 7-8-ft for the burn cut without "reliever" hole.

Central Mining - Rand Mines Group. This group of gold mines on the Rand used less P. M. single-use detachable steel bits in 1953 than in 1952 by 26%. This can be largely accounted by the growing practice of repressing the bits to get another usage out of them where possible. Among other groups the decrease is estimated at 10%.

Mysore Gold Mining Co. (KGF) Ltd. According to J. A. Lindsay, tungsten-carbide-tipped drill rods have now completely replaced ordinary conventional steel at this property of John Taylor & Sons in the Kolar gold field, South India. Local brazing of the carbide inserts into the drill rods is being done with great success. Cost of a locally produced rod tipped with carbide including the cost of the rod (4 rupees) was 29.18 rupees. On the same number of rods used per year as the commercially supplied type, the saving to the mine is 127,406 rupees. The brazing method will be described in a future issue.

JUMBO DRILLS REPLACE ELECTRIC ROTARIES

International Minerals & Chemical Corp., Carlsbad. In 1953, Joy CD-34 Jumbo drills were finally adapted for use in potash drilling, replacing post-mounted, electric, rotary drills. Productivity per man on drilling has been increased by about 100%, but further improvements are possible by changes in the mining system. Hand labor on drilling has been reduced to a minimum.

This change was made by discarding scrolled auger steel and substituting 1-in. alloy hollow hex. The steel was modified to use a 1⅜-in. carbide-tipped, 2-prong, rotary, drill bit. Cuttings were removed by compressed air blown through the center hole in steel and bit. This also served to cool the bit.

The CD-34 is a 4-wheel, rubber-tired-mounted Jumbo drill equipped with two drill booms. All functions are hydraulically operated and controlled from two operators' stations on the main frame. Hydraulic power is obtained from one electric motor driving several hydraulic pumps. Each boom is independently controlled with hydraulic power for any height, tilt and direction positions of the drill. Rotary motion is imparted to the steel by a hydraulic motor on each boom. Holes can be drilled to 12-ft maximum depth at about 10 fpm in potash ore.

The Jumbo is moved from place to place by a hydraulic traction motor. Electric power is supplied for pump, compressor, motors and lights by a trailing cable on a reel. Wheels are steered by hydraulic power. Compressed air is supplied by a small electrically driven compressor mounted on the Jumbo main frame.

Recently, additional Jumbo drills have been purchased and are only now being put into the mine. These are the Joy CD-42, an improved version of the CD-34. Basically the machines are the same. However, the newer model has more drilling power available by reason of separating the hydraulic systems of the two booms. These machines have no compressors. Spiral auger steel will be used to see if the improvements on the machine now make it possible to use this type of steel successfully. If not, compressors will be put on the machines and hollow hex steel substituted.

In driving vertical connections in International's mine between two levels separated by 50 ft of salt, the ore is passed in this area from upper to lower level through ore passes. A 4½ x 9-ft manway next to the ore pass was desired. A 12-in. hole was drilled initially in the manway center from upper to lower level. It was then reamed from a 2½-in. pilot hole. A pattern of 8 holes was then drilled around the 12-in. reliever the full depth of 50 ft. Each hole was then tamped full of powder and shot separately over the full 50 ft length. This opened up the manway from level to level for an area of 2½ by 4½ ft in the center. A nine-hole pattern was then drilled on each side of the initial opening. These holes were loaded from top to bottom and shot one at a time, which completed the shooting. The salt shot out, fell to the lower level where it was loaded by machine and hauled away. All holes were drilled with a post-mounted, electric rotary drill using 2-ft extension rods of EX drill rod. The blast holes were 1½ in. in diameter. With two drills, two men in three days can complete the drilling and shooting of an opening of this size.

JUMBO DRILLS, AND 10-FT CHANGE FOR 30-IN.

Pend Oreille Mines & Metals Co., Metaline Falls, Wash. Miner efficiency in drilling ore has been increased by substituting four drill jumbos carrying 10-ft. change machines for 30-in.-change drills mounted on bars and tripods previously used, according to Lynn M. Kinney, general mine superintendent. The jumbos comprise the Roger Iron Works crawler-mounted machine with air-powered tracks, also one Allis-Chalmers HD-5 diesel tractor and a D-4 Caterpillar diesel tractor, each equipped with frames for carrying the jibs and drills. The latter are Gardner-Denver D-93-P automatic drifters. Detachable 1¾-in. carbide bits are used on 1¼-in. round high-carbon steel.

The Survey of Mining Practice, by A. H. Hubbell, will be continued in the March issue of *E&MJ*.

EXPLORATION

The Paley Report Urges Exploration Research

"THE TECHNOLOGY of mineral exploration has lagged because comparatively little attention has been given to research and development in this field. The brilliant success of military detection equipment and of geophysical techniques in petroleum exploration is largely a direct result of millions of dollars invested in research and development. Although the problems here are much more difficult and complex, there is every reason to believe that an equivalent effort directed toward developing techniques for mineral exploration would yield commensurate results."—The President's Materials Policy Commission Report, Part IV, p 25

JAMES BOYD[1]
Exploration Manager
Kennecott Copper Corp.

James Boyd, Author, Endorses the Idea

"ORE FINDING is a research job in every aspect of its application, and the approach to exploration should follow the tried methods of research. Planned research is just as logical in prospecting as it is in prospecting the heart of the atom. Just as a physicist must have a reservoir of fundamental knowledge upon which to base his research, so must the exploration geologist have a fund of fundamental ideas upon which to base an interpretation of the evidence he has before him."

A REVIEW OF MINERALS EXPLORATION is a more difficult assignment than that of reviewing other industry technological developments. Exploration and prospecting are probably the most competitive aspects of mining and few are willing to talk of their accomplishments—and certainly none care to reveal their plans. For the same reason, reports of discoveries and plans in the press frequently lack complete details; hence the analyst has difficulty writing an accurate account of exploration projects. Thus a review can embrace only generalities, but despite this difficulty, there is still much that can and should be said about minerals exploration.

Extensive recent discussion has emphasized the need for expanding minerals exploration. The President's Materials Policy Commission made this topic the subject of several recommendations. Virtually every public speaker who discusses minerals or minerals policy has included some reference to exploration in his text. Whether or not such discussion has any influence upon the finding of new ore deposits is aside from the point: only those who are actively on the firing line realize that extensive exploration has been going on and that competition for land, upon which showings have been discovered, has become fierce—at least until recent months.

There are a number of factors which have contributed to this accelerated activity:

1. Until the recent drop in price of lead and zinc, there was expectation that if an orebody were found its products could be sold and sold profitably.

2. Until recently, shortages existed in almost every metal. The inevitable gap between demand and the discovery and development of new capacity was not closed until early 1953.

3. The Internal Revenue Act had been amended to "expense" exploration up to $75,000 maximum.

4. The Defense Production Act had been interpreted as permitting participation by government directly in exploration activities.

5. There was and still remains glamour in uranium.

6. Money available in relatively large quantities.

7. Active mining of available ore reserves during the war left most companies behind on ore development, and this ore had to be replaced if mining companies were to remain in business.

Now there appears to be a temporary lull in minerals exploration activity; some companies have cut exploration budgets; requests for DMEA contracts have decreased; and competition for land has become less acute.

The evidence, however, for continued exploration is conclusive. Economists, planners, and policy makers fear that we are running out of raw materials and that minerals shortages are holding back normal economic growth. Whether or not we agree with the statistics, or the recommendations of the President's Materials Policy Commissions, is of no real importance; the fact remains that the trend in demand is inexorably upward. Shortages in raw materials have always been acute when there is a sudden increase in demand, as during a war emergency. Under economic stress there are hysterical cries for more production and conclusions that we are running out of raw materials. Desperate conditions and emergency measures have fostered an over-correction of shortages and consequently there are now mineral surpluses even in the face of unequalled demands. It is not surprising that under these circumstances there are cries for help and reduction of exploration activities.

Analysis discloses that we have

[1] Editor's Note: Mr. Boyd has been appointed Chairman of the National Science Foundation Committee on Minerals Research.

also undergone a complete change in the economic climate for exploration and prospecting. Gone are the days of relatively easy discovery in accessible regions on land available for the staking. Hence opportunities for independent prospectors have all but disappeared; possibilities are remote that new bonanzas will be found within our national borders irrespective of enthusiasm or hard work.

"A NEW PATTERN"

Other changes have taken place within the industry that should give pause to those who would venture into or continue in extensive minerals exploration enterprise. During the past fifty years a new pattern of mineral production has gradually emerged. Formerly our metals and minerals were produced by small independent mining units — companies mining high-grade ore deposits, shipping their concentrate to smelters and in general operating on a small volume of ore. Today, mining has become in many instances a vast integrated form of mass enterprise with large companies operating low-grade orebodies, the product of which is carried through the fabricating stage to the market where it emerges in finished form. This has not been brought about by the design of a few; it is a natural development that has taken place throughout American industry. Mass production of consumer products requires mass production of basic raw materials. Where once iron and copper ores were produced by a number of small companies, today production comes from relatively few large mines. Industrial demands and the complexity of our modern economy, both in the United States and abroad, require increasingly greater quantities of basic raw materials as well as an ever-increasing variety of minerals and metals. Again our modern industrial economy requires large quantities of some materials at low cost; hence these materials must be produced by mass methods. Other materials, however, are required in relatively small quantities; their cost is of less consequence. There are numerous gradations between these extremes and from an exploration point of view an almost infinite variety of opportunities for all sizes and types of mining and metallurgical organizations.

By way of example, were an individual with little available capital to start from scratch alone in the mining business, he would be ill-advised to search for an iron ore deposit with the idea of operating it himself. The steel industry requires iron ore in excess of one hundred million tons a year and an independent iron ore competitor is facing heavy odds in terms of low-cost tonnage production. Similarly, the copper industry must compete today with producers of aluminum and steel. To remain in business the industry must constantly struggle to keep its costs down. No amount of argument can offset this hard fact of industrial life. Experience has shown that geologically, at least, copper in enough quantities to meet the demand and price must come from large deposits and, since most of these are low grade, there is no opportunity for a small operator to compete unless he is lucky enough to find a high-grade orebody. High-grade discoveries have been few and far between in recent years, and the search is made against heavy odds. Even if a prospector found showings as obscure as those of San Manuel, it would take more financing than is ordinarily available to the individual to uncover and explore the prospect.

Fortunately this same condition works in reverse. The organization required for large-scale operations is seldom efficient when dealing with a multitude of related problems where a mineral is required in relatively small quantities. Thus in the mining industry there is room for organizations of all magnitudes. Competition develops more between organizations of comparable size than between organizations of greatly different size.

NEW MINERALS SOUGHT

In minerals exploration the diverse groups complement each other rather than compete. Although intensive metallic mineral exploration in this country during the past century uncovered most of the important surface ore indications, and many with future promise, opportunity still exists for surface exploration in the newer field of fissionable and rare earth minerals. Some of these can be handled effectively by the smaller units of the industry and others lend themselves to the requirements of larger organizations. Also, during the progress of search, discoveries of large orebodies made by small groups may be profitably turned over to the large organizations. Again, small discoveries by the larger units can be made available to the smaller organizations.

COST IS MAIN FACTOR

The factor that really influences the trend of new mineral ventures is that of cost of search and discovery. Reduced opportunity for surface discovery necessitates the establishment of scientific teams of men with varying experience and skills who pool their ideas to solve the mysteries of geology and ore occurrence; from their activities will come most of the large and small discoveries of the future. In other words, it is conceivable that instead of the small units in the industry providing the larger ones with new reserves through discovery and sale as heretofore, the large units may well be operating in reverse and supplying the smaller units with reserves which the latter can operate more efficiently. There are instances where this has happened in the past and such activities may become more frequent in the future.

It should not be surprising that such a condition has come about, for it is a part of the development of the whole structure of modern industrial society. The tools of mass production are expensive and usually beyond the reach of individuals acting alone. To overcome the risks and hazards of normal life the individual takes advantage of mass protection offered by an insurance company; in order to produce automobiles at a reasonable price the invested savings of millions provide that service for the individual. Similarly, as the demand for raw materials rises, and the obvious deposits become exhausted and new ones harder to find, men must band together to spread the financial risks in-

(*Continued on p. 132*)

ORE DRESSING

BUNTING S. CROCKER,
Consulting Metallurgist,
Kilborn Engineering Co.,
Toronto, Canada

Industry Interest Centers On Hydrometallurgy

New hydrometallurgical processes held the mineral dressing spotlight all last year, as they will for years to come. New plants coming into production this year for National Lead, Sherritt Gordon, and others will answer industry-wide questioning on the potential of the new techniques. Otherwise, interest centers on grinding, with answers to time-honored questions beginning to appear dimly.

SOME OF THE MOST INTERESTING ore dressing developments during 1953 dealt with new hydrometallurgical processes. The need for them grew out of the tremendous rush to produce strategic metals, some for the first time, and some in much greater quantities than were ever produced in the past. Many new mills are being built to treat ores on which there is but limited knowledge of proper treatment.

The United States government is also in the background in the metallurgical picture. Its stockpiling, financial loans through DMPA, and general encouragement to industry, have resulted in greatly speeding up the construction of new plants. Low grade deposits are being treated now through either direct help during construction or promised fixed price for the delivered metal. Such deposits might not have been considered at all, several years ago.

All sorts of new metals are coming into prominence, such as thallium, rhenium, indium, columbium, uranium, titanium, and tantalum, to name but a few.[1] Many of these metals require new methods of ore treatment. Concentrates are now being leached under heat and pressure and with acids or alkalies. The work on these methods of treatment is still for the most part in the pilot plant stage.

True operating costs and capital charges for initial plants are still being awaited with great interest by the industry, because the future of such developments depends upon these cost items.

[1] See N. Arbiter, *E&MJ*, July 1953, p. 94.

CRUSHING AND GRINDING

Trends in crushing and grinding generally extend over several years. This year was no exception. No revolutionary ideas were forthcoming, but the year saw further development of several relatively new practices.

The coarse crushing rod mill continued to find favor in the 1-in. to 8-mesh range. Australia recently came into the picture when New Broken Hill Consolidated installed the first large primary rod mill in that country.

The scope of the coarse rod mill was a little more clearly defined as more plants reported results. It is generally felt that for very coarse work the rod mill should be run at reasonably high speeds (as at Consolidated Mining & Smelting Co. and at Lake Shore Mines). For finer crushing the slower speed rod mills are preferred (Tennessee Copper and Hayden).

Generally speaking, published work indicated more and more that each reduction machine, whether crushing or grinding, has its own optimum size range. When it is pushed beyond this range, it operates at decreased efficiency.

Crushing plants, particularly the bigger ones, are going to more stages using small reduction ratios and showing savings in steel consumption and operating costs, particularly on breakages. These points are further emphasized by high labor and steel costs.

High labor costs are also being combatted by more automatic control. Where the size reduction is small there is less need for close supervision. Most crushing plants today are automatically interlocked so that everything shuts down and starts up in sequence in case of trouble. Magnets and magnetic pulleys remove scrap steel at all modern plants.

The one factor opposed to smaller reduction ratios is the apparent wish of some operators to build "the biggest aspidistra in the world"; namely, larger and larger mills. These usually mean fewer stages and fewer number of mills in a plant, cutting down on the flexibility of the operation.

There is, of course, nothing inherently wrong with large diameter mills, as long as the reduction ratio is not too great and the number of units used will allow changes in flowsheet to be made in the future.

No plant, however well designed by today's standards, should be erected that does not permit changes to be made. The plant in which the tonnage has been divided among several stages and several mills is more flexible than one in which all the tonnage goes through a single stage and/or through a small number of mills.

Other trends in crushing and grinding include the increasing use of spout feeders over the older, power-consuming, scoop feeders. Open-circuiting, of course, has helped this, and open-circuiting of all crushing and grinding machines is finding favor. Where classification is used, it is recognized that the separation must be clean. Big circulating loads, carrying large amounts of finished material, are rapidly going out of favor. Rod mills generally are being run at greater speeds. Harder alloy liners

are being used and liner profiles are being designed without sharp corners.

In ball milling, operators are realizing that flotation results can be affected by the time of residence in the mills and the type of classification used. An interesting point brought up this year is with regard to the surface of the grinding balls. The theory has been advanced that for best grinding, the surface of the grinding media should be rough and pitted, to retain the particles being ground, and not smooth and shiny.

THEORY

The year contained many interesting contributions to the theory of grinding. Fred Bond's Third Theory of Grinding received favorable comment all over the world. Certainly his empirical formulae, based on thousands of tests, are of invaluable assistance to all designers.

Jack Myers gave an interesting summary of his rod mill theories to the Symposium in Mineral Dressing in London. Bond also presented a synopsis of crushing and grinding theories. The Empire Mining and Metallurgical Congress, Australia, also brought to light several papers on comminution. Djingheuzian's paper on the science of grinding at the Canadian Institute was an up-to-date survey of recent grinding theories.

Canadian milling men are taking a step in the right direction by arranging to have the Department of Mines at Ottawa maintain sets of standard screens with a standard screening procedure so that any operator can send in a sample and have his screens standardized. With the 80% passing size becoming more generally used, this attempt at standardization is along the right lines.

That there are still many unknowns in the practice of operating grinding mills was clearly shown when the Tennessee Copper published the results of cutting down the ball load in their big Tricone mill.[2] The resulting discussion by the "experts" was one of the highlights of the year. It seems that the industry is waiting for someone to get right inside a running ball mill with the balls and see what is actually going on there!

A suggestion has been advanced this year that may help to iron out some of the controversies in the past. The suggestion is that in high speed coarse-grinding mills, where impact is a factor, the capacity of these mills will vary as D^3 but in slow speed fine-grinding mills, where attrition is a factor, the capacity varies as $D^{2.6}$.

Speaking of mill speeds, the Mining Congress arrived at the supposition that the rod mill is most efficient when grinding by impact, (i.e. at high speeds, 80% critical and up), and the ball mill is most efficient when grinding by attrition (i.e. at slower speeds, down to 55% critical).

Ball segregation has come in for quite a bit of thought. The Hardinge Co. has produced the Tricone mill with an 8 to 10 deg taper of the shell, which segregates the balls in the load.

Allis-Chalmers has introduced, or re-introduced, spiral liners with 8 to 10 deg angle on the liners, which also segregate the balls.

Having a percentage of the big balls at the feed end, and a percentage of the smaller balls at the discharge end would undoubtedly be an advantage if the feed to the mill were all one size or of a size that the smaller ball could not handle. However when mills are fed ordinary mixed sands, containing fine and coarse particles, the ability of a ball in a mill to select the particle it can handle somewhat counteracts the advantage of the segregated loads.

The spiral liners, brought out by Allis-Chalmers are said to increase the flow of material through the mill. This, of course, could change the grinding picture and could prove more beneficial than the segregation. It should be realized that the importance of ball segregation within the mill decreases with the size of the feed and also with an increase in the circulating load.

CRUSHING

Rolls for crushing had not received much attention lately until the recent Hollinger paper was published giving their practice.

The world's largest primary crusher is now being built by Allis-Chalmers for the Reserve Mining Co.'s taconite project. It is a 60 x 109-in. gyratory, weighing 1¼-million lb. and has a rated capacity of 3,000 tons per hour. It has a swivel dual drive with two 500-hp motors.

Twisted conveyor belts are being used more frequently in crushing plants. Cleveland-Cliffs has successfully installed one to combat severe cold and wet sticky muck.

GRINDING

Big-diameter mills are still being installed. White Pine's six 12½x 13-ft (inside the liners) will rate with the world's largest. One of these mills with liners will weigh 300 tons. They are driven with 1,-500-hp synchronous motors. They are expected to be in production by late 1954. Most of these big mills are driven with fluid drives which, if run at top speeds, seem to operate satisfactorily.

A novel feature in rod mill liner design was suggested by MacDermid, of Snow Lake, when he proposed and tried using the lift in only the two liners adjacent to the ends of the mill. This practice worked well at Snow Lake, simplifying liner construction and cutting down on dead weight.

Dry grinding in conventional Hardinge mills of 10-ft diameter with air classification was started late this fall by the Johnson's Company in the asbestos field. Greater recovery of asbestos fibre was shown by the test work.

Pebble grinding with local ore continues to progress. Lake Shore and Wright-Hargreaves have now run for three years, establishing firm operating data and costs. The Neptune mine in Nicaragua is proceeding with an installation after a successful pilot test. Tennessee Copper is using limestone pebbles to grind limestone at one of their mills.

A type of ore grinding is being tried on the Iron Range where a company is putting 400 tons per hour of hematite ore through a 10 ft x 66 in. conical mill, using 4-in. ore as the grinding medium. No steel balls are used and the process is called "abrasion grinding."

Fred Bond states that metal wear is more consistently expressed in terms of kwh per lb of metal than as lb per ton ground. Wet grinding

[2] *E&MJ*, June, 1953.

ball and rod wear will average 6 to 7 kwh/lb, liner wear about 30 kwh/lb, and crusher wear about 35 kwh/lb, all including normal throwaway weight.

SIZING

The following relatively new machines appear in the news this year. The Dorr Hydroscillator and DorrClones are used to size specular hematite ore at Cleveland-Cliffs, Humboldt and Republic's beneficiation plants. The DorrClones make a split at 20 microns and send the underflow to flotation, and the slime overflow to waste. DorrClones are also used at Reserve's Babbitt plant, and the Hydroscillator at Oliver's Pilotac plant. At the Folsom Dam aggregates preparation plant in California, a DorrCo Sizer and classifier combination is being used in the grinding circuit to produce specification sand for concrete. The Isabella plant of the Tennessee Copper Co. is planning to duplicate the Hydroscillator installation of their London plant.

Electrically-heated screens are used more frequently for damp material. Many improvements have been made in their use.

Fine wet screening is gradually spreading in use and application (particularly in tungsten milling). Repulping troughs built into the screen have completely changed the usefulness of wet screens. The repulping troughs enable the operator to use dilution efficiently to assist the screening process without wearing a hole in the screen with his water spray. Above about 20 mesh these machines are very efficient and definitely superior to mechanical classifiers.

Cyclones are still one of the preferred machines for making backfill from mill tailings for underground mining operations. Kerr Addison in Northern Ontario produces 2,000 tons per day from 4,500 tons of tailings ground to 91% minus 200 mesh. They use twelve 12-in. high speed rubber-lined DorrClones for the primary separation and seven of the same size machines as secondaries. The clean sands are stored in large tanks and flushed underground with water.

CONCENTRATION

The need for titanium and other heavy metals has led to the concentration of minerals containing these metals in low grade sand deposits in Florida. The Humphreys spirals have been successfully used to concentrate valuable minerals in enormous deposits of sand. Rutile, ilmenite, zircon, and monazite, have been economically concentrated.

Dupont de Nemours Co. has plants at Jacksonville and Starke and is planning another (the Highland Plant) to start early in 1955 near Lawtey, Fla.

The Trail Ridge plant near Starke is interesting in that it is mounted on three barges which are floated up the lake formed by the dredges moving the sands. The plant capacity is 20,000 tons per day. The sands here were so abrasive that the spirals wore out in one year and a half. As the plant has 704 rougher spirals, 264 cleaner and 132 recleaners, this abrasion proved costly. It was satisfactorily combatted by lining the spirals with molded sheet neoprene, ¼-in. thick. In all, they used 7½ mi of neoprene to complete the job.

In the new Highland plant a dry mill is also being built in which the concentrates from the wet mill will be treated electromagnetically and electrostatically. The output will be 100,000 tons per year.

In Australia, titanium and zirconium concentrates are also being recovered on a 50 mi stretch along the southeastern Queensland Coast using spirals. Scientists at Melbourne University are looking for improved methods for reclaiming titanium from hundreds of miles of sandy beaches in Australia.

NICKEL AND COPPER

Most nickel and copper producers were actively expanding during 1953, and some small or lower grade deposits were brought into production. Many were spurred on by DMPA loans and guaranteed higher prices for nickel. The Sudbury district in Canada was particularly active.

Falconbridge expanded its plant and two smaller mills came into production, Nickel Offsets and East Rim. These plants have magnetic concentration followed by flotation. The concentrates are shipped by truck to Falconbridge for conventional smelting. Falconbridge is rushing its Fecunis Lake mine into production.

International Nickel has announced a new method of treating low grade, pyrrhotite ores from its mines. It plans to spend $16-million on a new plant to treat 1,000 tons of pyrrhotite concentrate per day.

The government-owned Nicaro plant in Cuba came into production again with the ammonia leach process. Also in Cuba, Freeport Sulphur Co. is working on a sulphuric acid leach process to recover nickel and cobalt from its orebodies at Mao Bay. The ore runs 1.35% Ni and 0.14% Co.

After years of treating oxide copper ores, the new Chuquicamata sulphide plant was put into operation. Treating 30,000 tons of ore per day, it is one of the largest and most modern copper plants in operation.

Noranda is planning to have its Gaspé copper mine in operation by October 1954. It has 70-million tons of 1½% copper ore and plans to treat 6,500 tons per day.

In Northern Rhodesia, the N'Changa and Rhokana copper-cobalt mills have reported further progress in their metallurgy.[3]

HYDROMETALLURGY

Great interest has been shown all year in the leaching processes under test in both the United States and Canada. The Chemical Construction Co. in the United States and the Sherritt Gordon Co. in Canada have been threatening to revolutionize the metallurgy of the base metals such as copper, nickel, cobalt and even zinc and manganese with their developments. Many of the processes have worked out successfully in the laboratory and test mills, and it now remains to prove that they can work in full scale plants.

One of the first plants to get under way was Howe Sound's cobalt recovery plant at Salt Lake, treating concentrate from the Blackbird mine in Idaho. This plant uses an acid leach in autoclaves under heat and pressure and although the chemistry is reported as being sound, mechanical problems are delaying full scale operation.

The Sherritt Gordon Mines Ltd. plant at Lynn Lake (the concentrator) and at Fort Saskatchewan (the refinery) is proceeding satisfactorily. The 2,000-ton concentrator and the old town of Sherridon were moved 165 mi north across virgin bush and set up again at Lynn Lake. Quite an engineering feat! This plant will use the For-

[3] *E&MJ*, August 1953, p 82.

(*Continued on p. 132*)

IRON ORE BENEFICIATION

FRED D. DeVANEY,
Chief Metallurgist,
Pickands, Mather & Co.
Hibbing, Minn.

New Taconite Projects Now Assured

Decisions vitally affecting the Lake Superior region and the nation as a whole were taken in 1953, when the taconite projects were launched. Beyond this field, magnetic separation and use of cyclones and jigs received major attention.

THE YEAR OF 1953 was one of great activity for the iron ore industry not only for the Lake Superior iron ore district but for the country as a whole. The production of iron ore from the Lake Superior district exceeded the 99-million ton mark which is a record for the district and exceeds the previously high record made in 1951 of 96,998,943 tons. Not only was the production of iron ore high, but the activity in the growing taconite industry was stepped up markedly and decisions were made relative to the use of taconite that will affect the life of the Lake Superior iron industry for many generations.

Although the actual production of concentrates from taconite is still small, the utilization of these taconites made them the major item of interest and discussion in the Lake Superior district. In the spring of 1953, the Oliver Iron Mining Co. put into production a big new taconite pilot plant located near Mountain Iron. This plant contains three units and has a rated production of 500,000 tons of product per year. Like the Erie and Reserve plants, already in operation, this plant treats magnetic taconite only. Some idea of the scope of what the taconite industry may eventually mean to the Mesabi district may be gleaned from that fact that the three taconite pilot plants now in operation treat 10,000 tons of crude ore per day and have a rated capacity of 1-million tons of finished concentrate per year.

In December 1953, the Erie Mining Co. operated by Pickands, Mather & Co., announced that they would proceed immediately with the construction of a large plant with all the necessary auxiliaries to produce concentrates from taconite. Erie constructed and operated the first pilot unit plant at Aurora in 1948 and the new plant design will be based on findings made at this pilot unit.

The steel companies having an interest in the Erie Mining Co. are the Bethlehem Steel Co., The Youngstown Sheet & Tube Co., Interlake Iron Co., and The Steel Company of Canada, Ltd.

IMPORTANT DECISION

This decision of Erie to go ahead with the construction of a major plant is of utmost importance since this means that with the decision previously announced by the Reserve Mining Co., which treats taconite for the Republic Steel Co. and Armco, most of the major steel producers of the country have decided they will secure a sizeable portion of their iron ore in the future from Lake Superior taconite.

Reserve Mining Co. has carried on during 1953 an active program for bringing their taconite property into production. A pilot mill designed to produce 300,000 tons of concentrates per year has been in operation during the entire year. Reserve's plans for their large plant call for mining and crushing the ore at the mine at Babbitt and then sending this crushed ore by railroad to Beaver Bay where a large concentrator is now under construction. The concentrated ore will be pelletized at Beaver Bay and this material loaded into pockets at the dock, and shipped from there. The operation will be an entirely integrated one. It includes the construction of a company-owned railroad which is nearing completion, which will run in a north-south direction 55 mi from Babbitt to the plant at Beaver Bay, on Lake Superior. The plans also include the construction of a new harbor with the necessary breakwater and dock facilities. Reserve Co. will also construct at Beaver Bay a power plant sufficiently large to provide for all of the power needed in both the mining and milling operations. This integrated installation will have a rated capacity of 3,750,000 tons of a pelletized concentrate and the estimated cost of the entire project is about $160-million. Present plans call for some production from this plant in late 1955. The plant is to be named the E. W. Davis Works in honor of the director of the Mines Experiment Station at the University of Minnesota, who has had so vital a part in the development of the taconite industry.

The Erie taconite holdings that are being developed lie just to the west of the Reserve holdings and are centered around the town of Old Mesaba which lies about 5 mi to the northeast of the town of Aurora. The plans recently announced by Erie are that they will construct a plant capable of producing 7.5-million tons of finished product per year. Plans are that this capacity will be increased to

produce 10.5-million tons of product per year. The mill site which is now being cleared and graded is just north of the town of Old Mesaba and will be situated on the ridge just to the north of the iron formation. Erie's plan of operation is basically different from Reserve's in that Erie plans to carry on the complete milling and pelletizing operation at this locality and ship only finished products to the lakes.

The Erie plant when it reaches its ultimate production will treat 88,000 long tons of ore per day which will make it the world's largest single concentrator. The pelletized product from the mill will be shipped over a new railroad which the company will build and which will extend a distance of 73 mi, almost due east to the shores of Lake Superior where a new harbor will be constructed in the vicinity of the towns of Schroeder and Tofte and which will be known as Taconite Harbor.

The large production of ore from the Lake Superior district came not from taconite, which has held the limelight during the year, but from an increase in production of direct shipping ore from open pits, to a lesser degree from underground mines, and to the concentration of the increased amounts of low grade ores.

FLOWSHEETS CHANGE

Over the last few years a distinct trend has developed in regard to the flowsheet employed in treating low grade ores. In the washing section of the plants, there is a very noticeable tendency to use spiral classifiers for washing purposes. For ores requiring more than washing to bring them up to grade, the trend has been to treat material coarser than ¼ in. by the heavy density process.

In heavy density plants, treating one size of ore, drum-type separators are preferred by most operators, but where two sizes are treated, drum types are usually used for the coarser size and spiral classifier machines for the finer material. Only one open-top cone separator remains in operation in the Lake Superior district.

The treatment of minus ¼ in. plus 80 mesh wash product has always presented the greatest problem to Mesabi metallurgists. In the past, a great variety of equipment and processes has been used for this purpose but in recent years the trend has been towards the use of either the cyclone separators using magnetite as a suspending medium or towards the use of specially designed jigs. Jigs are still being used at some plants for treating all sizes of the washed product but the trend in recent years has been towards the use of the heavy-density process for the coarser portion of the size range. The heavy density process enables operators to make a sharper separation of values than is possible with jigs in minus 11½ in. plus ¼ in. size range and has made it possible to treat considerably lower grade materials than could be handled by jigs.

The M. A. Hanna Co. installed the first cyclone plant on the Mesabi at its Buckeye mill in 1951. Since that time there have been a number of installations made by other companies for treating the minus ¼ plus 80 mesh washed fraction of the ore. The separation is ussually effected in cyclones of from 12 to 15 in. in diameter where the carefully sized and washed ore is separated using a magnetite suspension. Because of the centrifugal forces acting in the cyclone it is not necessary that a high medium density be maintained in the cyclone and the usual density is held at about 2.2 to 2.3. The actual cycloning operation is quite cheap but the equipment necessary for preparing the feed and the magnetic equipment required for recovering the magnetite from both the float and sink product is expensive. For example, a two-unit cyclone plant and auxiliary equipment capable of treating roughly 150 tons per hour will cost approximately $425,000. The actual cost of the cyclone separators will not exceed $3,500 but the cost of the magnetic separators required is about $80,000.

This state of affairs, while pleasing to the manufacturers of magnetic equipment, is a detriment to the installation of cyclone plants except where the ore reserves are large. The cyclone separators, however, do make a separation that is quite sharp and even though the first cost of such plants is high, their use is increasing.

On the Mesabi, the M. A. Hanna Company has cyclone installations at its Buckeye and Harrison mills. The Cleveland-Cliffs Iron Co. has installations at the Hawkins, Hill-Trumbull, and the Holman mines. The Jones and Laughlin Steel Corp. has a 2-unit section in its Hill-Annex plant. Pickands, Mather & Co. is installing a cyclone unit for its West Hill mill, which will be in operation for the start of the 1954 season.

The Charleson Mining Co. has continued the use and development of its Remer jig and Remer jigging system for treating lean iron ore. A new double stroke jig has been developed, which has a high speed short stroke superimposed upon the conventional stroke. The jig operation is characterized by the recirculation of a large quantity of middling products so that one jig is not expected to make both a concentrate and a tailing. With good supervision, these machines and method reportedly give results that are superior to those that have been achieved with jigs in this district in the past.

SEPARATOR ARGUMENT

In view of the many plants using the heavy density process with ferrosilicon as the medium, and with a number of cyclone plants in operation using magnetite as a medium, and with the growing importance of the concentration of magnetic taconites, the subject of magnetic separators is one of paramount interest in the Lake Superior district. In new plants that have been built using either the heavy density process or the cyclone process, drum-type separators have preference over belt-type machines. The argument as to whether concurrent or countercurrent machines are best still continues.

The argument that countercurrent machines would give a better tailing has not been entirely demonstrated. One reason for this is that due to the considerable amount of coarse material in the feed, relatively large spigots must be provided for sand discharge and in so doing, much of the pulp passes through these spigots and does not travel any distance counter to the rotation of the magnets and, therefore, much of the advantage of the countercurrent drum is lost. In the countercurrent drum, the feed is usually admitted on the same side as the concentrate is discharged. This short distance of travel for the magnetic product frequently

shows up in insufficient cleaning of the concentrate.

In heavy density plants and in cyclone plants, there seems to be a definite trend towards the use of electro-magnetic separators for the primary machines and permanent magnet separators for the scavenger machines. Some of the makers of magnetic equipment believe that permanent magnets can be built that will be strong enough to handle the high loads that are expected of primary separators but the operators as yet prefer to put their trust in high strength electromagnets, some of which use forced oil cooling to dissipate the heat from the high current input. Permanent magnet drums, however, can be built amply strong for the scavenger circuits and their use prevents loss of ferrosilicon or magnetite due to power outages or shorts in the primary electromagnets. There is also a tendency in newly designed plants to increase the number of magnetic separators as compared to those in the earlier plants and especially so in the scavenging or secondary positions. Many operators now feel that the capacity of standard type primary separators should be limited to 6 tons or 100 gpm of pulp per foot of magnet width per hour for magnetite used in cyclone plants and 10 tons or 120 gpm of pulp per foot of magnet width for ferrosilicon recovery.

SEPARATOR VARIETY

In the concentration of magnetic taconite, a great variety of magnetic separators is currently being used in the three pilot plants in operation. Reserve Mining Co. uses both the drum and the Linney type machine for cobbing service and uses drums for finishing.

Erie uses drums for all types of service and currently is using concurrent drums for cobbing the rod mill product and countercurrent machines in the ball mill cobbing circuit and for final magnetic separation. Erie, which pioneered the use of the permanent magnet drum on the Mesabi has now had one drum in service for two years in the finishing separator circuit and believes that permanent magnets are satisfactory for at least the final stages of magnetic separation, but has not yet tested drums sufficiently strong for the cobbing service.

In the Oliver's taconite plant at Mountain Iron, all of the magnetic separators are of the belt type and no drum machines are in use. One fact that has become very evident to users of drum type machines is that these drums must be protected by some type of a cover to prevent wear of the shells. The wear on stainless steel drums treating taconite or in heavy density or cyclone service on lean iron ores is high, and if these are not protected the shell can wear through in a surprisingly short time, with the resultant loss of the magnet coils through water seepage.

The trend at most plants at present is to cover these drums with rubber sleeves that may extend across the whole distance of the drum or as bands approximately 8 in. wide.

Some operators insist that these covers be made as smooth as possible in order to minimize the carrying over of concentrates. The use of a wrap-around stainless steel wear cover of 1/16 in. to ⅛ in. thick as used in one operation in the Tri-State zinc district is being considered.

Construction work is nearing completion on the flotation plant the Cleveland-Cliffs Iron Co. is building to treat the Humboldt ore in Michigan. The ore at this mine is largely a specular hematite and the new plant will use an anionic flotation process in which the hematite will be floated away from the gangue minerals. This plant will operate on a 12 month a year basis and will have an initial capacity of 70 tons per hour. The concentrates from this plant after dewatering will be shipped to the Ford Motor Co. for sintering at their River Rouge Plant. The concentrator should be in operation in the early part of 1954 and will be the first commercial flotation plant in the Lake Superior district.

It is also understood that Cleveland-Cliffs will build a two-unit flotation plant for treating a similar specular hematite ore at Republic, Michigan, a short distance south of the Humboldt operation. This plant is scheduled for operation during the 1955 season and, like the Humboldt plant, will be operated on a year-around basis.

There is a trend towards extending mining operations on the Mesabi to the west in areas not previously worked. The new West Hill plant of the Western Mining Co., operated by Pickands, Mather & Co., was placed in operation during 1953 and is the most westerly mine in the district. The Jones & Laughlin Steel Corp. is now opening up its Lind-Greenway mine just to the west of the West Hill property. An even greater extension of the Range to the west will be made when Pickands, Mather & Co. puts into operation their Tioga No. 2 mine which is located on the west side of Lake Pokegama. A 700 ton per hour mill embodying heavy density and cyclone separations will be installed at this property for operation in 1955. This mill will be in most respects very similar to the recently opened West Hill plant.

The use of troughed screens was employed at a number of plants on the Mesabi with favorable results. A more effective cleansing and scrubbing action is secured by employing these washing troughs than by sprays only. This observation was found to hold true for both material preparation screens and for screens in the heavy media section of the mill. In the West Hill heavy density plant, the use of such screens has resulted in reduced attachment losses of ferrosilicon medium.

CYCLONES AS SIZERS

The use of cyclones as a sizing device rather than as a concentrator also was given considerable attention in the Lake Superior district. Cyclones were used for the rejection of slimes from the fines treatment plant at the Canisteo property of the Cleveland-Cliffs Iron Co. The Erie Mining Co. in its taconite operation has thrown out its spiral classifiers for closing the ball mill grinding circuit and is using cyclones exclusively. The reason for this change is that cyclones give a sharper separation, require much less space, and also use less water. With an equivalent grind, the cyclone overflow has a considerably higher per cent solids than the comparable spiral classifier overflow. In addition, demagnetization of the cyclone feed, to avoid intense magnetic flocculation, is not so critical.

There is considerable activity in the Cuyuna District in regard to milling. The Zontelli Co. placed in operation at its Virginia concentrator a 60 ton per hour cyclone concentrator unit as a substitute for the former jig section.

METALLURGY

A. W. SCHLECTEN
Missouri School of Mines
and Metallurgy
Rolla, Missouri

Theory and Practice Get Together

1953 was exceptional in bringing forth an unusual number of valuable contributions which try to explain extractive processes in terms of fundamental reactions and relations. Even better, some of these articles suggest improvement in practice on the basis of a better understanding of the true nature of the processes.

THE REVIEWER FINDS many articles that give interesting and valuable accounts of current metallurgical practice. Likewise, he comes upon a few papers describing fundamental research concerning substances and systems encountered in metallurgical practice, but very rare, indeed, is the published article which attempts to relate theory and practice in the field of extractive metallurgy. The past year was exceptional in this respect.

An outstanding example is an article by T. R. A. Davey on the desilverizing of lead bullion. He has collected data from other workers on the alloys of lead, zinc and silver and presents them in a connected ternary equilibrium diagram. Next he shows how various examples of present day practice can be explained in terms of the diagram and what products can be expected.

Davey goes on to propose a small-scale continuous desilverizing process. He states that the well known Williams' process now in use at Port Pirie is ideally suited for large installations but becomes less desirable for small producers. In the Davey process bullion flows continuously into a kettle where the second crusts are stirred in. The outflowing mixture goes into a second kettle where first crusts are removed and then to a third kettle where new zinc is added and stirred and finally to a fourth kettle which resembles the bottom half of a Williams' kettle. In this last kettle the bullion cools as it sinks to the bottom; the second crust floats to the top and the bullion is removed by a siphon extending almost to the bottom of the kettle. The process would operate at about 400 deg C except for the final kettle.

Davey also proposes a degolding procedure to separate gold and copper from the main body of silver bearing crusts. Instead of removing a preliminary gold crust, he suggests taking the retort metal from the distillation of regular first crusts and removing a gold-copper crust before cupellation. This would lessen the difficulty caused by copper in the cupellation and also save most of the work in parting the doré.

PARKES PROCESS

Another proposal to improve the Parkes Process has been described recently. Lange-Eicholz and Wasow have developed an isothermal procedure and have made an application for a German patent. Their process is carried out essentially at 330 deg C and requires only 2 to 2½ hours. It differs from regular American practice in several respects.

The original bullion is run into a kettle containing the second crust from the previous charge which has been tapped or siphoned from the kettle. One third of the zinc addition is made, the kettle is stirred, and the first crust is removed and liquated. Then the remaining zinc is added, the kettle stirred, the second crust allowed to accumulate, and the desilverized lead tapped or siphoned out.

Zinc is added as a hot saturated solution in lead at 550 deg C, and the hot original bullion is depended upon to melt the second crust, so there is no heating and cooling as usually practiced.

Continuous vacuum dezincing following desilverization of lead bullion has also been studied by Davey at Port Pirie. His paper is mainly a theoretical study although a description of the actual plant equipment and practice is expected soon. Davey's calculations show that theoretically a vacuum kettle operated under conditions such as used at the Herculaneum smelter should reduce the zinc content of the bullion to 0.50% in 24 minutes instead of the 5 hours actually used. This lack of efficiency may be caused by the zinc condensing prematurely and falling back into the bath.

The continuous dezincing device at Port Pirie is arranged so that the lead bullion flows down the surface of a truncated cone. Thus a large amount of surface is exposed to evaporation, stirring is not needed, and the zinc vapors travel horizontally to the condenser so that they cannot condense and fall back into the lead. Graphs are given to show the effect of time, temperature, and degree of vacuum on the removal of zinc. The possibilities of condensing the zinc in liquid form are also considered.

Another application of vacuum in lead smelters is described by Professor D. de Souza Santos who reports the successful commercial operation of a 6 retort vacuum furnace for the treatment of silver crusts in Brazil. Using an 8 hour cycle at 920°C and with a vacuum of about 1 mm Hg, a residue of about 70% Ag is obtained which is refined electrolytically without previous cupelling. Cast iron retorts are used and there have been no failures so far. Pilot plant experiments on this process were reported by Schlechten and Doelling three years ago before the AIME.

Continuing with lead metallurgy, we find another paper using theory to explain practice in a discussion of the recovery of copper from lead blast bullion by D. Gallagher appearing in the Proceedings of the

Australasian Institute of Mining and Metallurgy. Gallagher considers the drossing of bullion and the treatment of the dross in a reverberatory furnace either by the iron matte process or the soda matte process developed by AS&R. He points out that although the soda matte process gives a better copper-to-lead ratio, it also tends to produce a speiss which may be high in antimony. Gallagher's attempts to analyze the drossing and dross treatment in terms of available thermodynamic data are not too successful. As he points out, more information is needed on the multi-component systems such as Pb-Cu-As-Sb-Fe.

Rontgen, Hilgers, and Gottschol have conducted experiments concerning the rate of oxidation of antimony in lead. Their work shows that the occurrence of a maximum rate of oxidation at low antimony contents, as has been reported in connection with continuous softening, is the result of the presence of other less noble impurities. In lead containing only antimony the oxidation of the antimony is a first order reaction; that is, the more antimony, the higher the rate or removal.

A brief account of refining secondary lead by the Harris Process has been made by P. H. Bootman. He found that an increased $NaNO_3$ addition under conditions to prevent frothing resulted in an increased refining rate by a factor of four. This showed that the rate of adding oxygen and not the rate of oxidation had been holding the operation back.

LEAD SINTERING

Lead sintering technique at Trail as it has been developed by extensive tests is related by R. Bainbridge. The new sintering plant, which will have a daily capacity of 2000 tons of finished sinter, receives a feed 80% finer than 200 mesh and 25% of the material is a zinc plant residue in the form of a slurry containing 30 to 40% water. The flowsheet as evolved by tests calls for drying and nodulizing the feed previous to first pass sintering. This product is crushed through ¼ inch, mixed with water and binding agents, and nodulized again before final sintering. There will be three 10 ft machines; one each for first pass and second pass, and one as a spare.

COPPER METALLURGY

There have been a number of interesting practical papers on copper metallurgy recently; some dealing with overall plant layout, others with specific details of furnace design and operation. Under the first heading comes the series of papers describing the new sulphide plant at Chuquicamata and the paper by Byrkit on the new smelter at Ajo. Also of interest is the proposal for the new White Pine Copper smelter which features a single reverberatory with a suspended basic arch. This furnace, fired with pulverized coal, will be fed by a belt from the bins; a reversing tripper will discharge the mixed concentrate and flux into hoppers along the side of the furnace. Because of the low iron in the feed, about a 65% matte will be obtained. The matte will go to a single 13x30-ft converter, and the blister will be fire-refined to give a finished copper, which will be cast into commercial shapes.

The new smelter at Mt. Isa, as described by R. V. Anderson, will have two 8 hearth Garfield roasters with 19½-ft hearths. Calcine will be transported to the reverb in cars and fed through two Wagstaff guns. The reverb, 17x90 ft inside, will have a sprung silica arch and will be fired with pulverized coal, both the primary and the secondary air will be preheated. A 38% matte is expected, and no limestone flux will be needed because a copper ore with lime and magnesia gangue is available. There will be two 10x20-ft converters and a 10x20-ft holding furnace which could be used for refining.

Reverberatory and waste heat boiler design at Hurley are the subject of an article by E. A. Slover. Probably the most interesting feature is the "Dutch Oven" in which preheated air is burned with gas to achieve temperatures as high as 2900 deg F before the flame is turned into the working zone of the furnace. This innovation has reduced magnetite build-up and increased the tonnage smelted.

H. Foard has discussed gas combustion practice at copper smelters. He describes a simple barrel burner made of 8 to 10 in. pipe that can readily be adjusted. He also points out the evils of secondary air from furnace openings, and deplores any attempt to use this air regularly for the combustion mixture. Foard recommends that the furnace draft be regulated so that there is a zone of positive pressure which pulsates as though breathing.

The rehabilitation of the ASARCO copper refinery is the subject of an interesting account by Weis and coworkers. The necessity of continued operation during the changeover required elaborate planning and methodical procedure. The before and after pictures are most eloquent in showing the improved working conditions, and the authors state that the man-hours per ton of copper refined have been reduced.

Arc furnace smelting of cathodes at the Kennecott refinery according to Shaw and Whitton has made considerable progress but is still far from perfect. A change to 18 in. diameter electrodes from the original 14 in. has given a substantial increase in melting rate from 15 to 22 tons per hour, and at the same time has decreased electrode breakage and wall temperatures. However, the power factor was reduced and the arc stability was poorer.

PROPOSAL AT BAGDAD

Bagdad Copper proposes to increase its mill tonnage from 3,500 to 9,000 and to recover the copper by roasting, leaching, and electrodeposition. This general proposition has been put forward many times in the past, but has failed to displace the more orthodox pyrometallurgical methods; many of the readers will remember the work of Hayward and Floe on the baking of copper sulphides with H_2SO_4 to produce water soluble sulphates. The present revival of interest is due to the effectiveness of the FluoSolids process in converting sulphides to sulphates. At Bagdad they expect 75% conversion to sulphate and 22½% to oxide. The calcine will be leached in a C.C.C.D. system using corrosion-resistant equipment. The copper will then be deposited electrolytically.

Such a flowsheet will build up excess acid which will be used to leach oxide ore dumps. Copper from these solutions will be recovered by cementation on iron. Consideration is being given to the manufacture of sponge iron from the leach residue. Such a procedure for making sponge iron is in use at Ana-

conda and has been described recently by F. F. Frick.

The general problem of sulphate roasting by fluidized-bed techniques has been reviewed by Stephens. The great advantage is the close control of the SO_2 pressure; this makes possible high conversion to sulfates or even selective sulfating. He gives an example of roasting mixed cobalt and nickel sulphide at 800 deg C and 50 mm partial pressure of SO_2 which will selectively sulphate the cobalt.

Before leaving the subject of copper metallurgy, we should draw your attention to the small book, The Physical Chemistry of Copper Smelting by R. W. Ruddle. Even if you don't claim to understand thermodynamics, the extensive bibliography of 189 references dealing directly and indirectly with copper smelting will be of interest and value. The author has collected a great volume of information on the constitution of matte and of slags; on the formation of magnetite, on copper losses, on the elimination of impurities, and on the recovery of sulphur from smelter gases. References range from the early work of Wanjukoff to the most recent articles. The author attempts to correlate the laboratory studies with plant results; this is not an easy task. However, whatever your problem in copper smelting, you can find out what others have thought and have tried to prove by experimentation or collection of plant data.

FLUID-BED ROASTING

Returning to the subject of fluid-bed roasting; K. D. Grogan has described the plant at Giant Yellowknife which uses a split compartment roaster for two stage operation. The filter cake, repulped to 80% solids, is injected into the first compartment through an air-jacketed feed gun. This first compartment occupies about ¾ of the total volume and is separated from the second compartment by a wall of tongue and groove high temperature fire brick. The partially roasted material from the first stage goes through transfer ports to the second stage where it is finished. The calcine is quenched and pumped to the cyanide plant.

R. B. Thompson has studied fluid-bed roasting for SO_2 production for paper mills and acid manufacture. He states that if pyrite is obtainable at $10 per ton delivered, it is competitive with sulphur at $35 per ton.

In last year's review we referred to the volatilization of arsenic sulphide from a gold concentrate by heating it in a nonoxidizing atmosphere in the first compartment of a FluoSolids 2-stage roaster. Mention was also made of removing Pb, Cd, and Ge sulphides from ZnS concentrates in a similar fashion. Now we find the same procedure described for volatilizing SnS, as a method of recovering tin from tin ores, in U. S. Patent 2,600,351 issued to Wells, Thompson, and Roberts. They specify a temperature between 825 and 940 deg C, with at least 1% sulphur content in the uprising gas.

Some details of pressure leaching methods have been revealed during the past year. The reactions involved in the ammonia pressure leaching of nickel-copper-cobalt concentrates, the recoveries, and the analyses of the products are all described by Professor Forward. Wide application of such methods can be anticipated judging from papers that have appeared or are scheduled from the University of British Columbia. These include studies on the oxidation of galena in NaOH, basic leaching of uranium ores, and leaching of galena in ammonium acetate.

The Sherritt Gordon nickel refinery is still under construction, as is the cobalt plant of National Lead at Fredericktown. It is reported that the Howe Sound cobalt refinery at Garfield is having difficulties that stem primarily from abrasion and corrosion of the apparatus.

Direct production of elemental sulphur is proposed by the Mines Branch, Ottawa, with a process using pressure oxidation of the iron in pyrrhotite. The elemental sulphur thus released would form globules in a slurry and could be removed by screening. The finely divided iron oxide could be sintered to make blast furnace feed.

Articles on titanium are so plentiful that they are the source of the largest number of entries in Crerar Metals Abstracts. However, these references are almost exclusively on titanium alloys, the machining and working of titanium, and similar aspects. New methods of production are the object of much research, but no news is being given out. The new plant to be built by Crane will have an annual production of 6000 tons; other plant authorizations can be expected, judging from the findings of the recent Congressional hearings on the value of titanium to the defense effort. A 1500-ton plant is to be built in England by I.C.I., Ltd., and the Japanese are already shipping titanium to this country.

Titanium's sister metal, zirconium, is well written up in a series of articles presented before the ASM and assembled in book form. Details of its use in atomic energy installations are not revealed, but you can draw your own conclusions. A large zirconium plant has been built in Akron, New York, by Carborundum Co. using a process much the same as that of the Bureau of Mines with some change in the furnace design.

WHO'S WRITING?

This review started out with a complaint concerning the lack of papers on the fundamentals of extractive metallurgy of the nonferrous metals. This is further evidenced by the fact that in the Transactions of the AIME there are not sufficient papers to utilize the pages allotted to extractive metallurgy. In England the same scarcity has been noted in the Institution of Mining and Metallurgy and the Capper Pass Co. has established an award to encourage papers in this field.

Even more definite steps have been taken in the establishment of the Nuffield Research Group in Extraction Metallurgy at the Royal School of Mines. The organization has been given a grant from the Nuffield Foundation and presumably receives support from industrial concerns. Investigations will be made into high temperature chemistry, the nature of molten mattes and slags, and other related topics.

It would seem that we could use such a research center in this country; one that could undertake long term studies pertinent to extractive metallurgy without the pressure of solving immediate practical problems. Support from government research projects is not the answer, because these are usually granted from year to year and as a result both the programs and the employees have a lack of permanence. Industry has taken some steps to encourage research by establishing fellowships at various schools, but we feel that more extensive help will be needed in the future.

Why The U.S. Lead-Zinc Industry United In Appeal On Tariffs

OTTO HERRES
Vice-President,
Combined Metals Reduction Co.
Salt Lake City, Utah

In our issue of December 1953, a report was given of the hearings held in Washington before the U. S. Tariff Commission on the case for additional protection for domestic lead-zinc producers. Because it has been suggested that this report was too brief and left an incorrect impression of what took place, we are glad to publish Mr. Herres' report of the case presented by the domestic lead-zinc industry.

THE EDITORS

VIRTUALLY THE ENTIRE LEAD-ZINC mining industry of the United States with the exception of companies engaged in foreign mining activities presented positive and indisputable evidence to the United States Tariff Commission in the hearing held in Washington, D. C., Nov. 3-6, 1953, to show conclusively that the mines of this country have been seriously injured, and domestic smelters have been forced to curtail their production, because foreign lead and zinc flooded the American market at less than the cost of domestic production.

That the mines are suffering serious injury was unquestioned. The facts were freely acknowledged by all appearing before the Commission.

The question for the Commission to decide became not whether the mines were injured, but rather what steps should be taken to preserve an industry important to national defense and essential to the civilian economy. Only partial relief is afforded by the limited increase in duties which is possible under the existing law.

Well-qualified witnesses testified that the difficulty is caused by excessive imports of lead and zinc at low prices made possible by concessions granted under the General Agreement on Tariffs and Trade.

The National Lead and Zinc Committee, speaking for the lead and zinc mining districts of the United States, testified in support of its petition under Sec. 7 of the Trade Agreements Extension Act of 1951, as amended, for "escape clause" relief. At the same time the Committee presented testimony requested by the Committee on Finance of the Senate and the Committee on Ways and Means of the House of Representatives.

Workers and management, mining associations and labor unions, representatives of both mines and smelters from all parts of the country joined with the National Committee in requesting the Commission to recommend to the President the withdrawal or suspension of duty concessions on the foreign lead and zinc which are causing heavy losses to the mines of this country and bringing unemployment to many communities. But the maximum benefit obtainable by the limited 50% increase on duties over rates "existing in 1945," according to the testimony presented, is inadequate to provide relief from the destructive consequences of the excessive imports to the lead-zinc mines. The Commission, therefore, was urged to recommend further protection by such proper means as are available under existing law, or to report to the Committees of Congress the need for legislative action in case sufficient relief cannot be provided otherwise.

Evidence was presented and statements were filed from lead-zinc mining districts in Arizona, Colorado, Nevada, New Mexico, Idaho, Washington, Utah, Wisconsin-Iowa-Illinois, the Tri-State region of Kansas, Oklahoma and Missouri, Tennessee, and New Jersey showing that mines have been forced to discontinue or curtail production and lay off workers because imports of lead and zinc are being sold on the markets of the United States at less than the cost of domestic production. In fact, representatives of Canadian and Mexican producers opposing tariff by "escape clause action" admitted that the imports are being sold in the U. S. at less than the cost of production of the Canadian and Mexican lead-zinc mines.

Jean Vuillequez, vice president and director of sales of the American Metal Company, Ltd., which operates no metal mines in the U. S., but represents concerns producing in Canada, Mexico and South Africa, testified on this major point.

Commissioner Talbot: *"In other words, a foreign producer at the current market cannot bring lead into this country at a profit?"*

Mr. Vuillequez: *"Here again, I must say that our mines in Mexico are lead-zinc and it is the total value per ton of ore that counts. At the present price of lead of 13½c and 10c for zinc we are losing money in Mexico."*

Commissioner Talbot: . . . *"Neither the foreign mines or the domestic mines can produce lead at a profit at the current price?"*

Mr. Vuillequez: *"I wish you would add zinc to that, sir, . . . I wish to make the statement that at the current prices for lead and zinc. the mines that our company controls in Mexico are losing money."*

Testimony was presented by representatives of the domestic industry to the effect that foreign producers exporting to the United States gained considerable advantage over the mines of this country in competitive trade by devaluation of foreign currencies and because of their much lower wage scales.

Mr. Vuillequez confirmed the devaluation in the case of Mexico and stated that in 1948 the Mexican currency had a value of 4.85 Mexican pesos to the dollar. Today, it is 8.65 pesos to the dollar.

CANADIAN SITUATION

V. C. Wansbrough, managing director, Canadian Metal Mining Association, testified that Canada has a closely parallel situation to the United States because of the decline in lead and zinc prices. He stated that 15 lead-zinc producers in Canada have been forced to close operations in the past year. Some of the large and long-established producers have postponed expansion projects.

Testimony from Mr. Wansbrough and his consultant, G. C. Bateman, was to the effect that 55 lead-zinc producers were operating mines in Canada a year ago and 15 of them have been forced to close by low metal prices.

Their testimony showed that one Canadian company, the Consolidated Mining and Smelting Co., af-

Table I. How zinc imports cut production and employment in the Tri-State

Concentrate Production

Date	Mines	Lead tons	Price	Zinc tons	Price	Hourly Wages	Employment
May, 1952	68	2138	$200.07	13,721	$135.00	$1.75	2184
Aug., 1953	17	385	$166.50	3,662	$56.00	$1.25	357

filiated with the Canadian Pacific Railroad Co., operating the largest lead-zinc mine in the world, produces all of the refined lead and more than 70% of the refined zinc in Canada. The next most important is Hudson Bay Co., which produces the remaining refined zinc.

Mr. Wansbrough stated that prior to World War II, Canadian markets for lead and zinc were in Europe and the Orient but with the outbreak of war, these markets were lost to Canada. The U. S., which previously had been self-sufficient in the two metals, developed a deficit that was made up in considerable part by Canada and Mexico.

The shift in trade channels came about from the submarine menace and the occupation and devastation of much of Europe.

It was stated that the closing of lead-zinc mines in Canada on economic grounds was not in any degree attributable to tariff concessions granted by the Canadian government. Canadian lead-zinc mines exporting the major portion of their production are not concerned over tariff reductions on lead and zinc by Canada. The situation in that respect is not parallel to this country.

Mr. Wansbrough testified that the Government of Canada was forced to subsidize the gold mining industry because communities existing solely because of the mining activity in many cases would have gone out of existence unless something had been done to maintain the mines. Canada is solicitous of her mining communities.

Representatives of the lead-zinc mines in the United States testified that production figures for the past five years indicate an available mine output of lead in the U. S. amounting to approximately 400,000 tons a year. Secondary production recoverable from scrap amounts to approximately 415,000 tons. Thus some 815,000 tons from domestic sources is available for consumption. Reported consumption for 1952, a year of high business activity, was 1,130,000 tons, indicating a need for 315,000 tons of foreign material to supplement domestic supplies. Imports, however, were 643,643 tons, more than double the need.

Evidence was offered showing that mine production of zinc in the United States during recent years has been discouraged greatly by the heavy imports of low-priced foreign material entering our markets. But during 1951, and the first half of 1952 when foreign zinc was attracted elsewhere by higher prices, U. S. mine production was at the rate of approximately 60,000 tons a month, indicating an available output in excess of 700,000 tons a year if protection is afforded to maintain a healthy domestic mining industry. An additional 60,000 to 70,000 tons is recoverable from scrap. Reported consumption for 1951, a year of high demand, was 1,067,816 tons including pigments. For 1952 when losses were suffered by the steel strike, consumption was approximately 954,289 tons. Assuming 1-million tons to constitute normal consumption under conditions now prevailing, somewhat less than 300,000 tons of imports is sufficient to supplement supplies available from domestic sources. During 1952, 699,252 tons was imported, which as in the case of lead was more than twice the amount needed.

EXCESSIVE IMPORTS

Testimony indicated that imports of zinc in metal and ore came here in 1953 at a rate in excess of the total consumption of the United States. Foreign zinc has been offered in U. S. markets within recent months at a price of 9c lb, which is considerably below the cost of domestic production.

Total imports of zinc in all forms in June 1953 amounted to 84,257 tons, and in July to 85,212 tons. By comparison, total U. S. shipments of slab zinc in September were 57,547 tons including domestic, exports and deliveries to the government. Consumption of zinc metal in September was reported to be 76,134 tons. This means that enough zinc was being imported to close down every lead-zinc mine in the country and still leave a surplus above present needs.

Imports of slab zinc have increased tremendously over previous years. Foreign metal brought in during the first eight months of 1953 shows an increase of 139,951 tons over the corresponding period of 1952 as follows:

Jan.-Aug., 1953 ... 196,964 Tons
Jan.-Aug., 1952 ... 57,013
Increase ..... 139,951 Tons
Increase ..... 245.4 Percent

Notwithstanding the excess tonnage available for use from domestic production, imports of slab zinc for the year 1952 were 115,151 tons. And despite this substantial surplus of 1952, imports of slab zinc have increased 245% over 1952 during the first six months of 1953 to cause unemployment in the smelters of Illinois and mines throughout the country.

As to the need for increased tonnages in any particular grade of metal, it was stated that domestic producers may be depended upon to expand production facilities to provide whatever quantities are required if they have assurance of reasonable protection for their investments against the competition of low-cost foreign metal.

TARIFFS LOWERED

The tariffs on zinc ores and metal have been lowered under successive Reciprocal Trade Agreements negotiations to 0.6c and 0.7c per lb respectively, and on lead ores and metals 1 1/16c a lb. These duties afford no protection of consequence against low-wage imports and devalued currencies.

Representatives of the domestic industry stated that the extent of the injury to the domestic mining industry may be measured to some degree by the cost of production in this country. The experience of the industry is that an average combined price of 31c for a pound each of lead and zinc is required to maintain a healthy domestic mining industry. This return would not support marginal mines, but would yield a reasonable profit to well-managed properties.

Concerning Arizona, testimony showed:

"The picture of Arizona lead and zinc mining industry since the flood of foreign metals is a drab one.

"The lead-zinc industry in Arizona was a relatively young, growing industry, and the present condition of the market threatens to stunt its growth, if not completely wipe it out."

New Mexico sent word that from ranking fifth among the states in production of zinc in April 1952, with an output of 5,079 tons of recoverable zinc for the month, now not a pound of zinc is being produced. Lead-zinc mining had been a stable industry for many years and was continued during the depression years of 1930 to 1939. Large, well-equipped mines were opened during recent years. Employment at mines operating during 1952 dropped from 1292 to 134 by October 1953.

Conditions in Nevada are similar to those reported by New Mexico. Production of lead and zinc has practically ceased.

In Wisconsin 30 mines were in operation in 1952; by September 1953 the number had dropped to 5. Approximately 495 men have been thrown out of work in the mines. Prospect drilling machines exploring for new deposits of lead and zinc numbered 45 in 1952. In September 1953 there were only eight.

Man-hours worked in Utah lead-zinc mines dropped from 2,038,568 for the first half of 1952 to 1,217,008 for the first half of 1953, a decrease of 40.3%.

Other states and mining districts presented a similar depressing picture. Some representatives of the mining districts reported their problems in person; others filed statements with the Commission.

Charles E. Schwab, representing the Idaho and Washington Lead and Zinc Emergency Committee, stated of the Coeur d'Alene district, one of the ranking lead-zinc producing regions of the world:

"At the present time lead and zinc, as such, are being mined at a loss. Only due to silver content has the district been able to carry on."

Of the newly opened mines in the Metaline district of Washington he testified:

"A comparison of those lead-zinc districts of the U. S. which have no silver (such as Metaline) will reveal the unprofitable conditions existing without silver to pay for losses in mining lead and zinc."

Harold L. Childress, president of the Tri-State Zinc and Lead Ore Producers Association, composed of the major mining companies in the Tri-State zinc and lead mining district of Missouri, Oklahoma and Kansas, testified concerning the serious injury sustained by the mines in this region. He presented the comparison shown in Table I.

Miles P. Romney, manager of the Utah Mining Association, presented information showing that all lead and zinc produced in Utah during the first six months of this year was at a loss. Some mines continue to operate by selective mining of high grade ore, postponing development work and exploring for new ore reserves.

Clark L. Wilson, vice president of New Park Mining Co., an important independent producer in Utah, testified that the return to his mine on the market price of zinc is only 35 to 40% and the return on lead is 60 to 65% of the market price, but the mill treatment charge for concentrating the ore and the freight charge from the mine to the mill must be paid out of this return. He stated that the charges to maintain the property if it was closed down would bankrupt the company within one year.

INJURY TO WORKERS

John Marshall, representing the Chemical Workers Union of Bartlesville, Okla., testified that the workers feel "the Tariff Commission will recommend to the President to relieve the serious condition which we face in this industry"—"and to protect the jobs and an industry which we feel is so essential to the American government, particularly in time of war". He testified that men now were asking for work in his area.

Albert Whittaker, Jr., president, CIO Chemical Workers Union, Local 421, Jefferson City, Tenn., testified that the workers in the Tennessee Coal and Iron Division of the U. S. Steel Co. zinc mine at Jefferson City since Oct. 12, 1953, have been reduced to three days work a week and their take-home pay cut approximately 50% in the face of a rising cost of living.

Alton Thurman, president of CIO Chemical Workers Local 407, Jefferson and Knox Counties, Tenn., testified that his local represents workers employed by the American Zinc Corporation of Tenn. Now only three of the five company mines remain in operation and further serious curtailment is in prospect. Workers laid off have been unable to find employment in local industry.

George W. Haycock, representing members of the United Steel Workers of America working in the lead-zinc mines of Utah and Nevada, testified that the mines in his area were forced to close because of the excessive imports of lead and zinc or else were holding on at a loss. He cited wage cuts in the smelters of Pennsylvania and losses of employment in Illinois because of the fall in zinc prices.

Stephen N. Nagy, representing the workers at the New Jersey Zinc Company Plant, Palmerton, Pa., testified concerning the importance of the large plant where he is employed to national defense. He testified the workers at his plant also were feeling the effects of the excessive imports.

SUGGESTED REMEDIES

Opponents of tariff relief for the domestic lead-zinc mines under escape-clause action, acknowledging the need of a remedy for the serious situation which prevails, suggested the use of subsidies to support the mines and provide employment. The domestic producers without exception testified that they were opposed to subsidies for many reasons, and further that subsidies are not the cure for excessive imports.

As to quotas, members of the domestic industry concluded that with respect to complex ores and concentrates of lead and zinc a quota system of protection would prove complicated and difficult, if not impossible to administer fairly to all concerned. An anti-dumping tax was urged as affording a solution more in the public interest than the establishment of quotas on lead-zinc ores and concentrates.

The proposed sliding-scale import tax is not a high tariff measure but a tax to prevent dumping foreign metals on U. S. markets at prices which destroy the domestic industry. No taxes apply when the domestic market price is sufficient to permit the more efficient mines in this country to survive. At such levels the proposed import tax is removed, or becomes in effect a "vanishing tariff."

Representatives of the American lead-zinc mines contended that the effect of the reduced duties on the domestic industry was obscured by shortage and scare-buying during the Korean emergency and the recurring crises of the war and post-war years. Now with the lessening of international tensions and the return of competitive conditions in world trade, the serious consequences of the concessions have become apparent.

Exploration

(*Continued from page 119*)

volved in discovery. Once this is done, and once sufficient capital has been made available to meet the costs of discovery and discount possible failures, prospecting or exploration should become an established business with fairly predictable costs, assuming of course that the exploration group embraces men with experience and technical competence. Hence the search for buried or hidden deposits can only be done profitably over the long run by groups with sufficient backing to average successes against failures.

The question is frequently asked: why have there been so few new major mineral discoveries in recent years in this country? Some place the blame on government, others on taxes. This is an oversimplification of the problem and the solution will not be found by working on a "whipping boy" theory. Certainly part of the answer is that new deposits have become harder and costlier to locate. Obviously, entirely new techniques are required and new or improved use of old tools must be employed to meet these changed conditions.

Ore finding is a research job in every aspect of its application and the approach to exploration should follow the tried methods of research. Planned research is just as logical in prospecting as it is in prospecting the heart of the atom. Just as a physicist must have a reservoir of fundamental knowledge upon which to base his researches, so must the exploration geologist have a fund of fundamental ideas on which to base an interpretation of the evidence he has before him.

Considering the complexity and scope of geological sciences, it is not surprising that our discovery rate has been retarded, and the lack of fundamental research in this field has not helped to clarify the problems of ore search. Far too many exploration geologists are blinded by strict adherence to dogma or to theories of ore deposition which may be obsolete. Time, money and effort must be spent on establishing facts about the composition and behavior of the earth if we are to provide the basic ideas for a constructive approach to geology of ore finding.

Fortunately the need for such research has been recognized by the President's Materials Policy Commission. Resulting from its recommendation, the National Science Foundation has established a committee to advise the Foundation's staff on minerals research programs. This committee should be able to give direction and assist research now being prosecuted by existing agencies, both private and public. The appointment and organization of this committee during 1953 may be the most important step taken during the year in the exploration field. The work and the programs of the committee will be fully publicized and there will be opportunities for everybody interested in minerals exploration to take an active part. There will be limited funds available to the Foundation itself for fellowships and grants in aid for candidates expressing a wish and qualifying for such grants, but it is hoped that private industry will also sponsor research in the colleges and foundations, or their own laboratories where necessary.

During the early deliberations of the committee, members have emphasized the need for fundamental research which may lead ultimately to ore finding. In setting up committees to formulate the programs in each field (geology, geophysics, geochemistry, etc.) care has been taken to find teams of those best qualified in their specific branch of science through field experience.

Through this program, an opportunity is being provided for stimulating thought in the fundamentals of earth sciences, and results of such a program should ultimately have a direct application to field geological problems. When geological fundamentals governing the accumulation of oil were properly understood, petroleum geologists were able, some years ago, to interpret geophysical evidence with sufficient accuracy and confidence to enable discovery of new oil horizons and extend our petroleum reserves. Perhaps the mining geologist will never be able to exercise his talents as effectively; his problems are far more complex and he must sift and weigh many more factors on which to base his projections.

Until ore finding has become a more dependable science, the prospector will have to rely to a large extent upon surface indications in his search for minerals. This requirement will inevitably lead him to regions which have not been walked over a thousand times previously; many such regions will be in foreign countries. However, the need for locating new domestic mineral sources is paramount and requires a program of fundamental research in mineral resources. Encouragement must come from the government on the basis of our national security; from industry if each company is to remain long in business (no matter how onerous the current surpluses appear to be) and from educational institutions for the fulfillment of the primary function of expanding the knowledge of mankind.

Ore Dressing

(*Continued from page 122*)

ward and the Chemical Construction Co. processes which is an ammonia leach under high temperature (150-220 deg F) and pressure (125 psi). After leaching flotation concentrates of the metals, the dissolved metals are reduced selectively and precipitated as pure metal powders.

National Lead Co. is also planning to use the Chemico process in a plant at Fredericktown, Mo. to treat 50 tons per day of cobalt-nickel-copper concentrates.

Chemical Construction Inter-America Ltd. has signed a contract with Noranda Mines Ltd. for the construction of a sulphur-iron plant in Niagara Falls to be finished in the summer of 1954. This plant will treat 350 tons per day of pyrite concentrate from Noranda concentrates and produce 54,000 tons of sulphur per year and 75,000 tons per year of iron sinter. One-third of the sulphur will be produced as elemental sulphur and the rest as sulphur dioxide which will go to American Cyanamid's sulphuric acid plant.

The Chemical Construction Company also has announced a new process for treating low grade manganese ores on the Cuyuna Range.

FLOTATION

The new Wemco attrition flotation machine running in pulp densities as high as 83% solids introduced a new idea into the flotation field. An old idea was revamped in South Africa in recovering diamonds less than 1 mm. in size by a skin flotation process.

The annual meeting of the AIME in Los Angeles produced some lively discussion on flotation theories with Mr. Kleming from England upsetting some old theories on alkali depressants. The Empire Congress in Australia reviewed the use of sulphur dioxide in ore pulps to activate depressed pyrite.

ROASTING

Giant Yellowknife in the NWT of Canada published some results of their roasting work on difficult pyrite - arsenopyrite concentrates. They are using an Edwards type of furnace as well as a new Dorr FluoSolids reactor. The FluoSolids roaster now has two roasting compartments, which has greatly improved it for gold work.

The furnace has not been in operation long enough for the mill staff to give the final figures as yet.

The Aluminum Company of Canada has installed the first FluoSolids roaster to roast zinc concentrates. These reactors are also being used to produce a sulphate roast on copper-zinc concentrates•

Mica

(*Continued from page 112*)

land, Vt. "Isomica" and General Electric Co.'s "Mica Mat," also produced from scrap mica, have replaced splittings for certain uses, especially where uniformity of thickness and dielectric strength are important.

TRENDS

Mine scrap will be required in larger quantities as the reconstituted mica industry expands. Most processes now use factory scrap, but progress has been made toward utilization of mine scrap.

Replacement of water wheel power by purchased power that will lessen dependence of ground mica production on run-off water, is a trend in North Carolina where a prolonged drought curtailed production last summer.

Humphreys spirals are finding increased application for recovery of fine grained mica. Centrifuges are being used more and more for water removal.

Private industry showed increased interest in synthetic mica. Several companies experimented with solid-state-reacted synthetic mica produced by Brush Beryllium Co., and with flake synthetic mica made by the Bureau of Mines process of crystallization from a melt. There was increased interest in the possibilities of synthetic mica not only as a substitute for natural mica, but as a material with properties and uses of its own.

Research in reconstituted mica continued to show promise of developing substitutes for natural mica film in electronic capacitors and vacuum tubes.

Non-ruby mica sales to the government may attain a rate of $2-million monthly by mid-1954•

Feldspar

(*Continued from page 112*)

The capacity of the Spruce Pine, N. C., mill was increased 50%, new fine-grinding facilities were installed at Erwin, Tenn., and new equipment for feldspar flotation was installed at Kona, N. C.

Production figures for 9 months for crude and ground feldspar indicate about the same production as 1952. North Carolina continued to account for about 45% of the total crude and ground tonnage.

International Minerals & Chemical Corp. plans to build a plant at Blue Mountain, Ont., Can., for processing nepheline syenite. It should be in operation next summer•

Cadmium

(*Continued from page 96*)

Activity in 1954 in the cadmium industry will probably be on a slightly reduced scale. Supply and distribution will likely be brought closer to balance. Production will probably drop below the 1953 output as domestic mine production of zinc and imports of zinc concentrates diminish. If increased foreign consumption and stronger prices abroad, as evidenced late in 1953 continue, imports in 1954 will probably decrease. Apparent consumption probably will not change.

A potentially large user of cadmium is the nickel-cadmium storage battery, containing from 1.5 to 7 lb of cadmium. Production of the battery, however, has not been large since its introduction in the United States after World War II.

A new use, relatively minor, is in atomic energy development where it is used to control the fissionable elements in reactors•

Asbestos

(*Continued from page 111*)

industry for 1951 and 1952. Tables giving asbestos imports for the first nine months of 1953, (personal correspondence from Mr. Bowles) shows continuation of the previous downtrend.

Production of low-iron chrysotile in Arizona will show little change. In North Carolina, Mining & Milling Corp. of America's pilot plant started operation on anthophyllite ore from its Blue Rock mine near Spruce Pine. Nearly all of the output was used in floor-tile.

South America. J-M has relinquished its interest in the Colombian development. Production of blue asbestos continued in Bolivia. In Brazil the Morro Vellio mine near Nova Mina, Minas Gerais, produced about 900 tons of chrysotile. Another operation owned by French interests produced at about the same rate in this district. In Venezuela, American capital purchased control of Amveco, C.A., a company formed in 1953 for acquisition of the El Tigre mines and mill, and the Montanita property. Development of the Montanita mines and rationalization of the El Tigre mill started in November.

Rhodesia. Output reached an estimated 85,000 tons valued at about £7-million. Average selling price of the fiber (all chrysotile) was slightly over £81 per ton. Nil Desperandum mine produced about 50,000 tons in the Shabani area. Twenty different mines in the Mashaba district produced an additional 25,000 tons. The new joint venture of J-M and British Metals Corp., Anglo-Huronian et al. at Mashaba should start producing this year.

South African 1953 production may not have reached the 1952 record of 64,135 tons amosite, 44,734 tons blue. and 24,970 chrysotile. Of these tonnages, 17,000 were used within the country.

OUTLOOK

At the close of 1953 the asbestos industry seemed to be undergoing the same orderly readjustment

which characterized most industries. December showed textile business to be slow, brake-lining manufactures tapering off, asbestos-cement and paper production also cut back. Demand for shorts continued strong. Industry leaders seem to agree that these dips in shipments are temporary, and no stoppage of presently proposed new asbestos facilities has been intimated●

Silver

(Continued from page 77)

would go into free stock. There are, however, alternative methods which would result in the entire amount going into free stocks.

World production during 1953 amounted to an estimated 202,500,000 oz (See table). Outside the Western Hemisphere, Australia is the most important single producer. Available reports place that country's production at 11-million oz. Estimates for Japan are about 6,800,000 oz compared with 7,500 oz in 1952. Production has also been increasing in Western Germany for which reports indicate a figure of 2,600,000 oz compared with 1,900,000 oz in the previous year. Information from other countries, particularly Russia, is meager. Nevertheless a figure of 60-million oz is probably not unreasonable as an estimate of total production outside the Western Hemisphere.

Consumption of silver in the world has regularly been exceeding production of new metal. For the past five years the world has consumed, in the arts and industries and for coinage, an average of about 36,800,000 a year over and above new production. The difference has been obtained from sales of demonetized coin and other accumulated stocks.

Consumption in arts and industries throughout the world increased above 15% over 1952. However, a sharp reduction in silver used for coinage more than offset this, with the result that the world consumed about 5% less silver in 1953 than in 1952. Consumption for silverware, and jewlery increased somewhat from the previous year, but the proportion of silver used in this country for industial purposes, as distinct from the arts, continues to rise, and this trend will probably become increasingly evident in the future.

FORECAST

In the absence of change in the basic conditions affecting the silver market, prices should remain stable during the coming year. The Bank of Mexico will probably follow its long established market policies, since there are no indications of any developments which might make such policies impracticable. On the other hand, if need should arise, production of the U. S. could be diverted to the market at prices not much above the Government's buying rate of 90½c. In addition it seems reasonable to expect that at least some portion of the Treasury's free stocks would be available to industry at its posted selling price of 91c. It appears therefore that adequate supplies will be available to industry during 1954 and that prices will probably fluctuate only within relatively narrow limits●

Zinc

(Continued from page 83)

On the supply side, domestic smelters, including secondary production, turned out approximately the same quantity of metal as the previous year—about 965,000 tons. Two unusual features were (1) the amount of smelter feed from foreign sources which increased 15% to 518,000 tons, and (2) metal imports, usually a minor source, increased over 200% to 232,000 tons and accounted for 20% of the supply. The increase in imports of ore and metal was naturally at the expense of domestic mine production which declined 20% to about 537,000 tons. At the year's end, mine production had declined even further and was running 30% below the previous year's rate. It was becoming increasingly evident that at 10c per lb the domestic mining industry, which formerly supplied two-thirds of the U. S. requirements, might be hurt to the extent that the U. S. would become dependent on foreign sources for a major part of its supply.

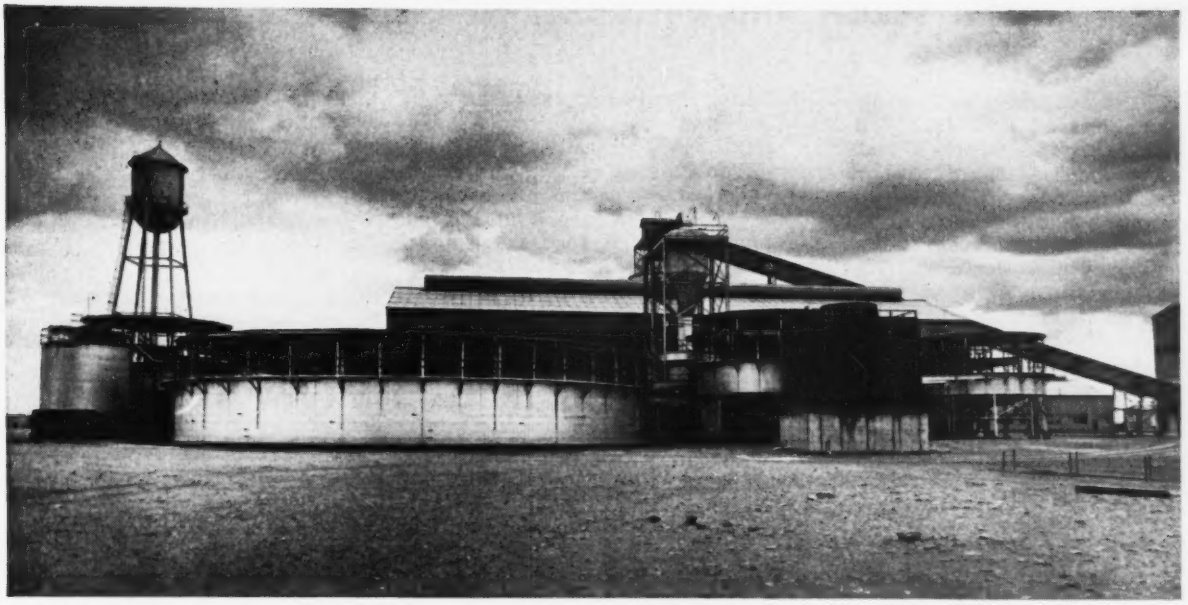
At 10c per lb, again referring to the "Relation of Primary Metal Prices", zinc is selling at 71% of the base with lead at 73% and copper and aluminum at 124% and 117%, respectively. Furthermore, the year's average price of 10.86c is only 35% over the 1946 level of 8.73c per lb, whereas mine wage rates have increased 72% in the same period and labor represents roughly 60% of the cost of producing zinc. Thus, it would appear that zinc is underpriced and could well justify an increase to bring it in line with the general commodity price level, and compensate for the increased producers' costs.

A summary of the slab zinc supply and consumption for the past two years is in the accompanying table. The apparent surplus in 1953 was accounted for by an increase in producers' stocks of over 80,000 tons and comparable growth in warehouse stocks, which cover both metal trading and import shipments held for later sale. There was little if any increase in consumers' stocks which ended the year at a little over one month's supply.

FORECAST

As for the future and 1954 in particular, zinc consumption should be guided pretty much by steel activity. The accompanying chart on U. S. zinc consumption shows how close this relationship has been in the past, with the exception of 1951 when Government restrictions interfered with normal zinc use. This is not surprising as 40% of slab zinc shipments are used directly by the steel industry and the die casting industry depends for nearly 80% of its market on the automotive and appliance industries, both of which are major outlets for the steel industry.

Based on this premise, and current estimates of steel production for 1954 of a little over 100-million tons, it appears that domestic zinc consumption will run about 870,000 tons in 1954. This is good consumption by normal standards. Coupled with Government shipments and exports totaling from 40,000 to 50,000 tons, over 900,000 tons of slab zinc plus 100,000 tons of zinc in ore for oxide, or more than 1-million tons of zinc in all forms would be needed. In estimating ability to meet this potential demand, note that at the



Overall view of the plant with a 120′ dia. Dorr Thickener in the left foreground handling flotation tailings. A 40′ dia. Dorr effluent Thickener and 40′ dia. Dorr Hydroseparator are at the right. All three units are covered to prevent temperature increases resulting from the sun's rays.

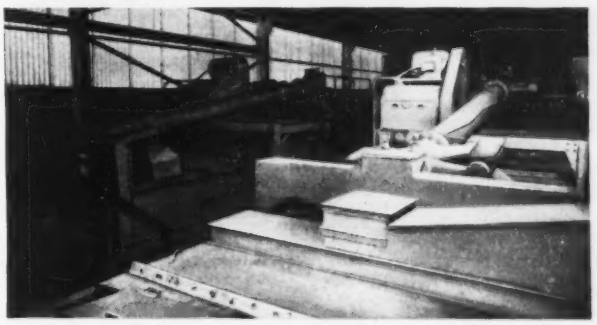
NEW MEXICO POTASH PRODUCER

Combines Chemical and Metallurgical Techniques at New Plant . . .

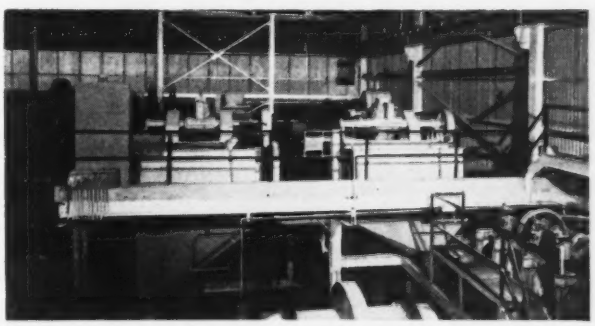
A new U. S. producer for the quality potash market, Duval Sulphur & Potash Company recently started up this modern plant near Carlsbad, New Mexico. A perfect example of the growing convergence of chemical and metallurgical techniques, the plant makes skillful use of the latest developments in both fields.

The flowsheet includes crushing, grinding, classification, hydroseparation, flotation, thickening, centrifuging, crystallization and drying.

At Duval, as throughout the chemical and metallurgical industries, Dorr equipment and techniques play a vital part in wet processing flowsheets. For more information on the scope of the Dorr technical service, write for bulletin No. 7002. The Dorr Company, Stamford, Conn. *In Canada:* 26 St. Clair Avenue, E., Toronto 5.



Closeup of two Duplex Dorr HX Classifiers. The Primary at right handles raw crushed salt which has been pulped with return brine. Sands go to a rod mill and fines to the Hydroseparator.



General view of the milling section. Rod mill discharge goes to the Secondary Classifier at the right. Sands are discharged to conditioners and fines overflow to the Hydroseparator.

Better tools TODAY to meet tomorrow's demand

DORR

WORLD - WIDE RESEARCH · ENGINEERING · EQUIPMENT

THE DORR COMPANY • ENGINEERS • STAMFORD, CONN.

Offices, Associated Companies or Representatives in principal cities of the world

year's end domestic mine production was off 25% from the first half rate and imports of slab zinc had dropped to one-third of the mid-year figure. While ore imports were holding their 1953 rate it was merely a question of time until they too would decline due to curtailment abroad and more favorable smelting charges on the Continent.

All in all, it would appear that while domestic requirements of the magnitude indicated will be met, and thus consumers need have no concern, it will probably necessitate improvement in zinc price•

Copper

(Continued from page 79)

smart recovery. The following figures tell the story:

	First Session, Aug. 5, 1953	Per Long Ton Dec. 30, 1953
Cash	£215-£217½	£235 -£235½
Three mos.	£200-£202½	£221½-£222

The absence of pressure of Chilean copper on the world market in the second half of 1953 undoubtedly upset the convictions of analysts that the total available supply soon would prove to be excessive.

For the record, it should be mentioned that the British, in freeing copper, profited by lessons learned in zinc and lead. The Ministry of Materials announced it had entered into arrangements to supply copper to the British market in the transition period and transfer a substantial tonnage to its strategic reserve. The tonnage available in the transition period was estimated at 60,000 tons, with settlement against purchases by consumers to be made at the average market price.

FORECAST

The long period during which producers of copper enjoyed operating in a sellers' market definitely ended with 1953. Only a renewal of hostilities could change the trend during 1954.

Settlement of Chile's copper problem has yet to be achieved and when final agreement is reached the result is bound to influence the market in that it will permit producers everywhere to reappraise the supply outlook and adjust their schedules.

The Chilean Senate, on Dec. 4, endorsed a deal that provided for the sale of its surplus of 120,000 tons to the U. S. for its stockpile; sell current output at the market price; and revise its tax and foreign exchange systems. The U. S. was ready to purchase the copper on the basis of 30c. The Chamber of Deputies failed to act on the proposal in time to close the deal before 1953 ended.

Though U. S. consumption of copper is expected to fall during 1954, demand for copper outside of this country could expand. A lower price should bring about a reduction in output. High costs most everywhere will exert a stabilizing influence on prices, once necessary adjustments have been completed. The U. S. stockpile can be expected to absorb more copper. New legislation will have to be passed to extend the period of suspension of the import tax•

Aluminum

(Continued from page 89)

with capacity operation, the four domestic producers should have a total output of 1,400,000 tons, about 12% more than in 1953.

As new alumina and aluminum facilities in Arkansas reach capacity operation, bauxite mining in that area is expected to rise again. Surinam and Jamaica shipments will continue to be the major sources of foreign bauxite and deposits in Haiti are being developed.

For the first time since 1938, the industry begins a new year with enough aluminum assured to fill all of the orders its sales force can get. The industry will therefore concentrate primarily on its sales campaigns and the development of new markets and new product applications.

INDUSTRY IS OPTIMISTIC

Despite the expected slight decline in the nation's total business activity, the aluminum industry expects to be able to market its 1954 output. The industry's optimism is based on these conditions:

1. The industry's ore supply and reserves are greater than ever. There is no prospect of any shortages.

2. Aluminum continues to have a favorable price position.

3. New applications of aluminum either being field tested or just going into production, promise to be substantial outlets.

4. Recently developed markets show promise of further expansion including building products, electrical wire and accessories, automotive parts, appliance components and packaging.

5. Many industries, finding 1954 markets more competitive, may turn to aluminum to make their product more economical or improve its appearance or performance.

Recent moves by leading copper and brass companies seem to confirm the aluminum industry's confidence. Kennecott Copper Corp. purchased close to $20-million of Kaiser Aluminum and Chemical Corp. stock, Olin Industries announced its decision to build a $5,000,000 aluminum fabricating plant, and the Bridgeport Brass Co. leased a $50,000,000 aluminum extrusion plant at Adrian, Mich. The aluminum industry seems confident that it can successfully meet the selling challenge offered by 1954 business conditions•

Tin

(Continued from page 91)

Sensing danger ahead, the International Tin Study Group held a meeting in London late in March. A "Working Party" was set up to consider proposals for international action. The "Working Party" met in Brussels during June and accomplished much toward bringing about a general conference of the United Nations group later in the year. Producers, naturally, saw no cure for the ills of the industry except through an intergovernmental agreement. However, sentiment among consumers was lukewarm over the prospects for an accord and they have yet to be convinced that the industry can establish a price that would be reasonable and fair to both the producer and the consumer. In most instances, consumers in the U. S. thought that a price of around 80c a pound for

for lower cost control of moderately **Corrosive** fluids

Fig. 2651-A Gate

JENKINS

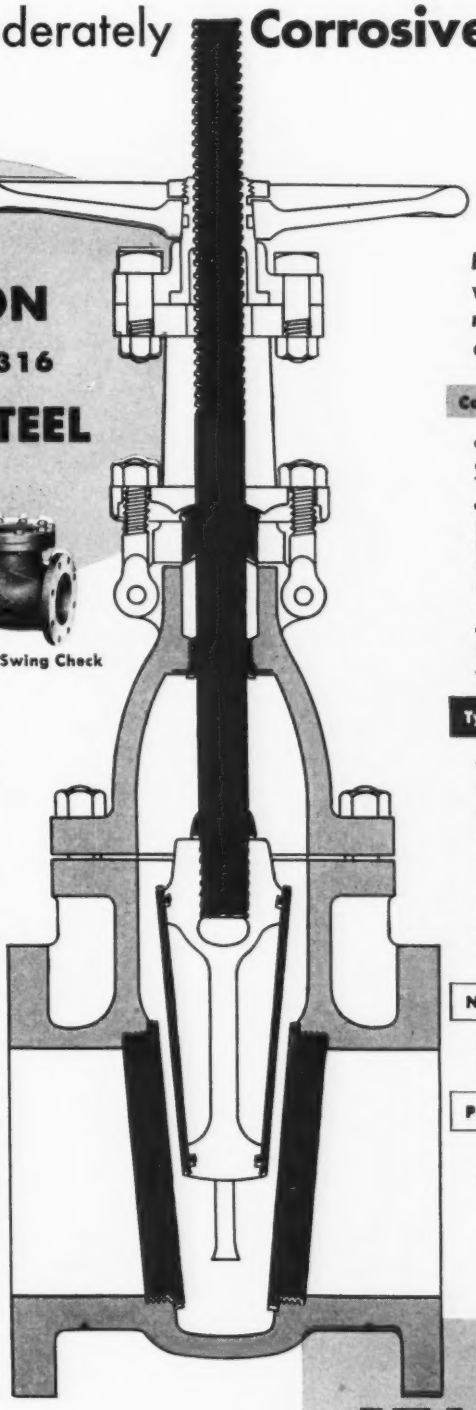
NICKEL IRON

Valves with Type 316

STAINLESS STEEL

Trim

Fig. 2624 Swing Check



This combination provides corrosion resistance well above the moderate need in many processing services with an investment well below that for all-stainless steel valves.

Designed primarily for the chemical process industries, they are recommended for control of mildly corrosive liquids with minimum quantities of mineral acids, such as creosote in wood treatment, and many liquids carried in petroleum processing.

A major use is in pulp and paper processing, particularly in lines serving the digester, and in the chemical recovery cycle. Service records in lines carrying the valve-punishing "black liquor" give Jenkins Nickel Iron Valves top performance rating.

Jenkins *extra value* construction throughout. Get details — compare. See why they stretch your valve investment dollar — with longer service life, lower maintenance cost.

Every part in contact with fluid is the right metal to block corrosion and beat wear.

Cast NICKEL IRON

- **BODIES** Heavy duty, dimensioned for greater resistance to wear and abuse. Through port design in Gate Valves.
- **BONNET** Rugged construction, like body. Swing-type gland bolts. Screwed-in back-seating bushing. Deep stuffing box.
- **YOKE** Integral with bonnet in 2″ to 4″ sizes.
- **WEDGE** In 10″ to 24″ sizes, with Stainless Steel Wedge Rings.
- **COVER** In Check Valve.

Type 316 STAINLESS STEEL

- SPINDLE
- GLAND
- BONNET BUSHING
- SPINDLE RING
- WEDGE PIN
- WEDGE RINGS Rolled into Nickel Iron Wedge in 10″ to 24″ sizes.
- SEAT RINGS
- DISC and HANGER in Gate Valve

NI-RESIST Type No. 2

- WEDGE of I-beam structure is solid NI-RESIST in 2″ to 8″ sizes.

PRESSURE RATINGS

2″ to 12″—200 lbs. O.W.G.
14″ to 24″—150 lbs. O.W.G.

GET COMPLETE SPECIFICATIONS from your Jenkins Valve Distributor, or write: Jenkins Bros., 100 Park Ave., New York 17. Ask for Bulletin 118.

JENKINS VALVES

LOOK FOR THE DIAMOND MARK

SINCE 1864 TRADE JENKINS MARK

Jenkins Bros

tin was a fair one under prevailing uncertain conditions.

Producers pointed out that "the main tin-producing countries affected by wide price fluctuatons are also under-developed areas. They are dependent to an important extent on the tin industry as a source of revenue. One of them—Bolivia—is dependent almost entirely on that industry for foreign exchange. . . . In the case of tin, the problem has become the more acute in view of the excess of production over commercial consumption which has persisted for the last five years."

STABILIZATION SCHEME

The United Nations Conference on Tin, held in Geneva Nov. 16 to Dec. 9, approved a formula that in effect deprives the United States of the veto power it wielded at the 1950 meeting. The provisions of the agreement, in part, follow:

Price—Initial floor price of £640 per long ton, equivalent to 80c a pound. Initial ceiling price of £880 per long ton, equivalent to $1.10 a pound.

Buffer Stock—Up to 25,000 long tons, to be contributed by producing countries: 75% in tin metal and 25% in cash for purchases of tin metal.

Management—Buffer stock, to be administered by manager, authorized to sell tin metal when price exceeds £800 per long ton on London market, and to buy tin metal when price falls below £720 per long ton. Export controls may be established when buffer stock has absorbed a minimum of 10,000 long tons and also when deemed necessary under existing market conditions.

To become effective, the agreement requires ratification between March 1 and June 30, 1954, by the governments of at least 5 of the 6 major tin-producing countries. and at least 9 of the 18 major tin-consuming countries.

The proposed agreement calls for an International Tin Council with headquarters in London.

FORECAST

Though U. S. consumption of primary tin is expected to fall moderately during 1954, consumption outside of this country should continue at about the same level as in 1953 and some improvement could take place as international trade extends its recovery. But stockpiling will drop off and this will present a major problem in balancing supply and demand that only curtailment in output can cure. Until the supply shows unmistakable signs of falling, consumers should not be blamed for following a hand-to-mouth policy in buying tin. A sharp recovery in prices, barring another upheaval in the Far East, is not in the cards.

It was disclosed that the U. S. Government will have a surplus over its stockpile needs by March 1954, of between 38,000 and 40,000 tons of tin (presumably in concentrates and pig tin). Injudicious disposal of this surplus by the present Administration in Washington appears to be remote, whether an international accord on tin becomes operative or not. Even with an agreement on tin it will take a long time to wipe out the surplus that hangs over the market. From here, it looks like a buyers' market•

Phosphate

(*Continued from page 109*)

for normal Superphosphate production. Annual capacity will be 200,000 tons.

International Minerals & Chemical Corp. purchased a Twin Engine Euclid Scraper, to remove overburden and for dam building. A new dragline, Bucyrus-Erie 1250-B with a 235-ft boom and 26 cu yd bucket, which will be the largest in the field, should be in operation at the Noralyn Mine in February 1954. Additions to the spiral section increased production considerably.

A Joy Model #75 rotary drill was placed into service to enable prospecting to keep pace with the expanding production facilities.

Acquisition of additional reserves in the vicinity of its present mines and improvements made in the recovery plants assure extended operations of existing facilities. Hence, the construction of a new mine has been postponed.

The new Bonnie Chemical Plant was completed and is now producing a defluorinated phosphate animal feed supplement and multiple Superphosphate.

Swift & Co. reports consolidation of maintenance facilities at Watson to improve quality and quantity of maintenance; increase capacity of three Raymond Mills by 20%; maintenance facilities for the phosphoric unit; new improved all steel matrix pump cars; improved design of trommel screen; rehabilitation of electrical system at Watson washer and recovery plant.

Virginia-Carolina Chemical Corp. reports that operation of the new 5-mi pipe line has bettered all expected performances.

New wet storage, drying and grinding facilities at Nichols should be ready early in 1954. It is believed that these facilities represent the most efficient large capacity materials handling combination in the field.

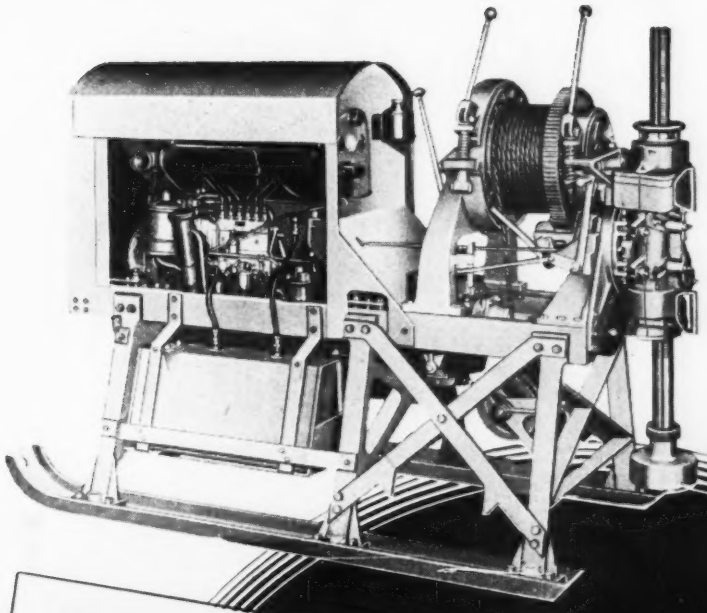
A new Triple Superphosphate plant at Nichols is expected to be in full operation before the middle of 1954.

Soon there will be an eighth miner in the Florida pebble field: Armour Fertilizer Works of Atlanta, Georgia, have announced that they are developing a new mine near their present Triple Superphosphate plant at Bartow.

FORECAST

Optimism for 1954 expressed in the section on Western rock, extends over the entire industry. A number of new and large-scale fertilizer works for triple superphosphate and nitro phosphates will start operations requiring over a milion tons of rock. With improvement in our farm economy, the market should be able to absorb the additional fertilizer production so that the new demand could become a net increase for the phosphate mining industry. The export picture also looks good and should continue at the high levels established in 1953, when some two million tons were shipped abroad (an estimated 1,750,000 tons from Florida, 250,000 tons from Montana into Canada).

Prospects are that world consumption in 1954 will considerably exceed last year's. As stated, the U.S.A., at least on the processing side, is prepared for a marked incease; in Europe, which during the last two years did not attain the peak of 1951, an upward trend is noticeable both as regards phosphatic fertilizers and also chemicals•



DIESEL POWERED

Boyles Bros. now offer you a diesel driven BBS-2 surface core drill. Here is the versatility of four interchangeable swivelheads—1½" to 12" holes—combined with the fuel and operating economy of diesel power.

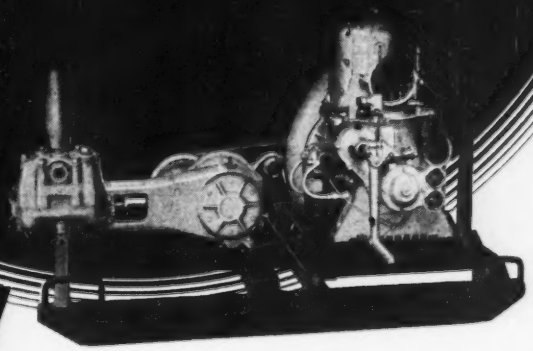
These diesel equipped units are proving highly satisfactory on our world wide contract commitments. Conversion kits available for gas driven models.

shipping weights (diesel)

drill with swivelhead	domestic	export
BUS-12AG	2970 lbs	3475 lbs.
BUS-12AH	3315	3905
BUS-23HH	3590	4180
BUS-23HFG	3540	4200

write for bulletin No. 172

New diesel motor cuts fuel costs on this rugged high pressure pump - - provides easy hand starting under all conditions. Engineered to our specifications, the dual capacity 5-12 meets a wide range of drilling requirements throughout the world.



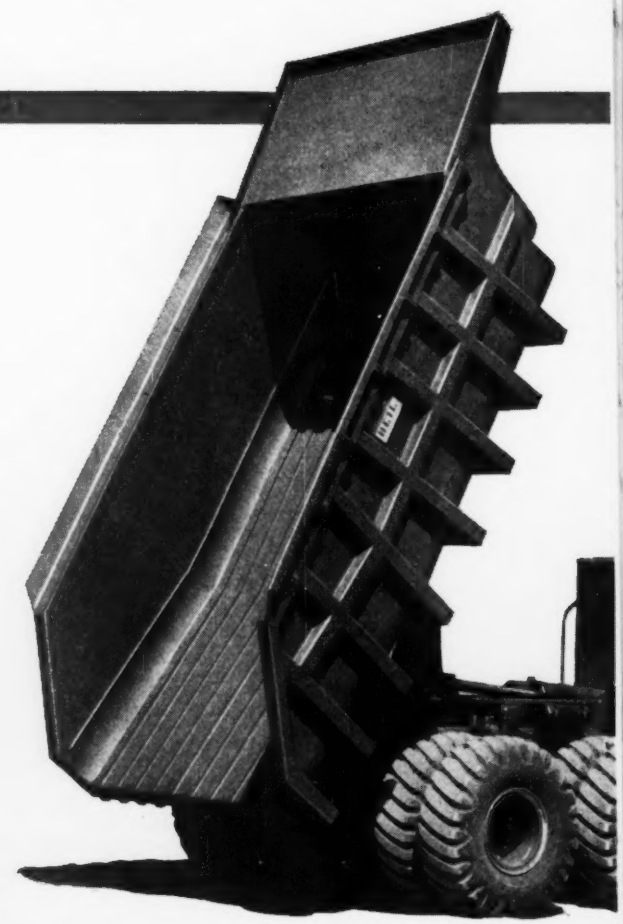
WE LOOK INTO THE EARTH

BOYLES BROS
DRILLING COMPANY LTD.,
VANCOUVER, CANADA

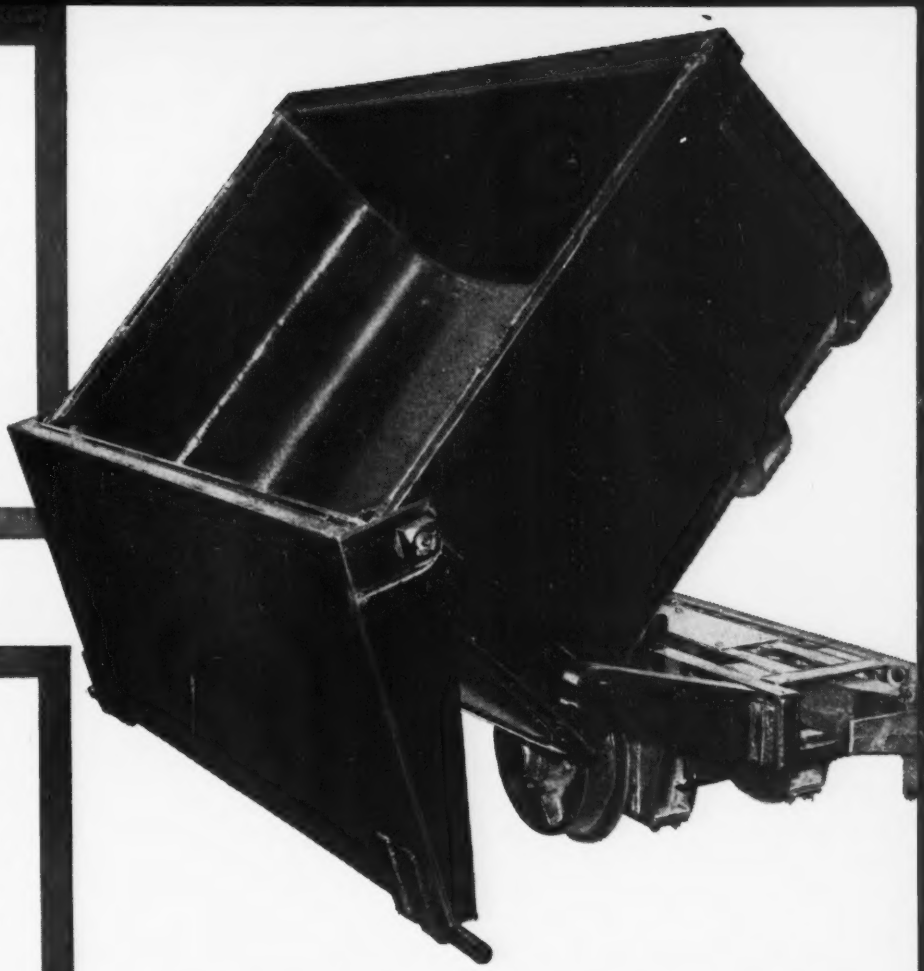
Mining equipment can do more work when it's built with

USS High Strength Steel

This Big Bucket can scoop up 30 cu. yds. of overburden at one bite. This means it has to take a lot of pounding and abrasion. And it can—because it was built with USS TRI-TEN steel which insures high resistance to impact and shock even at low temperatures, along with high strength and good welding properties.



Here's a Heavy Duty 50 Cu. Ft. Car built with USS COR-TEN steel. The car was especially designed to stand up under the most severe conditions. It has a 5/16" thick body and a 1/2" thick inside liner—both made of COR-TEN steel plate. This extra rugged construction, which greatly increases strength and durability, pays off in fewer breakdowns and longer life.



Built with USS MAN-TEN steel this 28 cu. yd. capacity hydraulic dump truck body—one of the world's biggest—can carry 45 tons of material, can dump a full load in 20 seconds and has a road speed of 32 miles per hour. Here's real ability to deliver the goods.

WITH USS High Strength Steels you can give your mining equipment the rugged durability it needs to stand the punishment of today's high speed mining operations.

These famous "steels that do more" will keep your equipment *in* operation, moving tonnage, and *out* of the maintenance shop where repairs and replacements cut into profits. For USS COR-TEN, USS MAN-TEN and USS TRI-TEN steels have a 50% higher yield point than ordinary carbon steel. In addition to greater strength they provide higher resistance to fatigue, wear, abrasion and impact.

These superior physical properties of USS High Strength Steels can be used to materially increase the strength and life of equipment without increasing its weight. Conversely, in some applications it is possible to use these tough steels in thinner sections to reduce weight without reducing strength, or to increase the size and capacity of equipment, without increasing its weight or the power needed to operate it.

Moreover, if your mining equipment must work in sub-zero temperatures, or under unusually corrosive conditions, you can build it with a USS High Strength Steel that will resist these destructive forces to keep it on the job and prolong its life.

For more information or application data about USS High Strength Steels phone or write our nearest office.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS HIGH STRENGTH STEELS

USS COR-TEN • USS TRI-TEN USS **USS MAN-TEN • USS A-R STEEL**

4-488

UNITED STATES STEEL

WASHINGTON IMPACT

Morton A. Reichek, McGraw-Hill Washington News Bureau

Randall Commission Recommendations Stir Split on Foreign Trade Policies

AS FAR AS MINING is concerned, last month's report of the Commission on Foreign Economic Policy (Randall Commission) may be one of the most important government documents written in recent years. It spells out the Administration's maximum views on world trade, and is a gage to what mining can expect from Washington in foreign economic policy.

The Randall recommendations endorsed by the majority of the commission are taken by the free traders as putting the Eisenhower Administration squarely behind the free trade policies of the New Deal and Fair Deal —lower tariffs, simpler customs and rate structures, continued easing of the barriers that now hinder imports into the U. S., and free traders feel that this marks an important victory for their side of the perennial battle over freer trade vs. more protection: They now have the Eisenhower team openly and publicly behind their point of view.

But the other side of the coin is this: Some of the most powerful Republicans in the House and Senate were members of the Commission— Senator Millikin and Congressmen Reed and Simpson—and they dissented right down the line on the controversial recommendations.

Hence, one thing is assured—and that is a continuation of the Congressional split over foreign trade policy. As things stand now, it looks as though Eisenhower might get some of the key Randall recommendations this year. At any event, it is certain there will be no further raising of tariff barriers this year.

Best guess as of this moment is that there may be a three-year extension of reciprocal trade legislation— but without the new tariff cutting authority Randall asked for by the President.

There is one big question mark in the situation, however: How much will Eisenhower fight to bull the Randall recommendations through Congress? And how much will individual Congressmen and Senators change their past voting records as a result of such pressure?

Certainly if Reed, Simpson and Millikin are any example, it seems certain the protectionist bloc will not be budged very far.

The report recommends that the President's authority to negotiate reciprocal trade treaties under the Trade Agreements Act, which expires in June, be extended for at least three years, and that the President be granted power to reduce tariffs without reciprocal concessions for products that are not important imports.

It also recommends that the escape clause and peril point provisions be retained. The former allows domestic producers injured by foreign competition under a reciprocal trade treaty to apply for increased tariffs; the latter authorized the Tariff Commission to recommend—before such treaties are negotiated—maximum tariff reductions that wouldn't "injure" domestic industry. The report recommends, however, that the President's right to disregard these findings be made more specific.

The report of the 17-man Commission contains these proposals on other foreign trade issues:

Foreign aid and technical assistance. Programs should be continued, but should be educational, not "big money" projects involving capital investment.

Private investment abroad. Government should strive for "acceptance and understanding abroad of principles underlying the creation of a climate conducive to private foreign investment," specifically by treaties creating common rules on fair treatment of foreign investment. A related recommendation: Liberalized tax measures on foreign investment.

Market stability. Conceded that greater price stability is important to both raw material producing and consuming nations, but objected to solution of this problem by intergovernment commodity agreements involving export or import quotas, price limits, reserve or buffer stocks, production controls, or some combination of these devices.

Such agreements introduce "rigidities and restraints that impair the elasticity of economic adjustment and the freedom of individual initiative, which are fundamental to economic progress." They would also cost the U.S. too much money. (It's noteworthy, however, that some officials here deny that this Randall Commission comment kills chances of U.S. participation in the pending tin agreement.)

Commission's ideas on how the U.S. could aid greater world price stability: (1) relax trade barriers here and abroad; (2) encourage diversification of economies in one or two-crop countries like Bolivia and Chile; (3) avoid stockpile or commodity control policies that disrupt world prices; (4) cooperate with other nations to improve knowledge of world supply and demand for raw materials; (5) maintain domestic policies which "would temper fluctuations in the U.S. economy."

New York investment banker John Hay Whitney, a Presidential appointee to the Commission, hedged a bit on international commodity agreements, suggested consideration of treaties that "take into account long-term trends in world demand and supply." CIO Steel Union President David J. McDonald, another Presidential appointee, was even more vigorous on this point and dissented to the Commission's statement.

U.S. dependence on imports. Reported that the U.S. depends on foreign sources for over 30% of its requirements for copper, lead and zinc, over 50% for tungsten, bauxite, and antimony; over 75% nickel; 100% tin. Conceded that this could be eliminated by intensified exploitation of high-cost U.S. mines, but deplored this as too expensive.

The Commission declared that additional foreign sources of critical materials could be developed by adoption of practices hospitable to foreign investors. Said the report: Investors must be assured against "unpredictable or capricious levies on exports or production by the countries of origin" and against a U.S. tariff policy that bars easy access to markets here.

Commission's Metal Experts

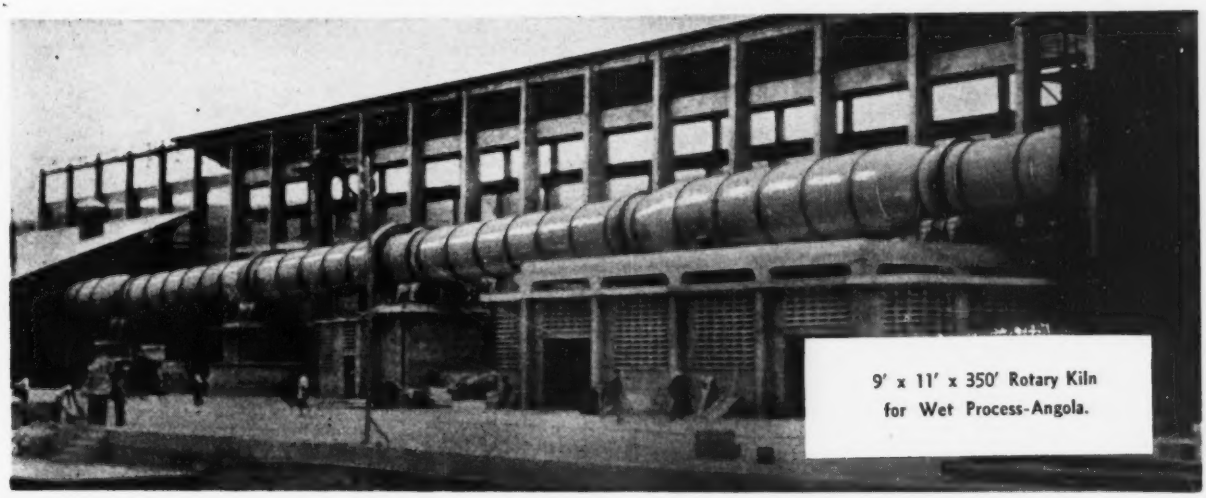
Much of the Randall report's reference to metals and minerals was made by Lamar Fleming, Jr., the Commission's vice chairman, who is president of Anderson, Clayton & Co., Houston cotton brokers. The Commission's staff economist for metals and minerals was Dr. Donald Sham, one-time chief of WPB's non-ferrous metals branch. His aide was Herbert O. Rogers, a New York metals and minerals broker.

Sham prepared a lengthy paper on metals and minerals for the commissioners, on which Randall metal references are based. A condensed version will be published this month as a supplement to the report. It stresses the growing dependence of the U.S. on foreign sources, but emphasized that these are mainly in the western hemisphere and are heavily controlled by U.S. capital.

Sham's paper points up the plight of domestic mining, and suggests subsidies, buffer stocks, and increased exploration assistance—rather than tariff protection—as aid to the industry. To support his anti-tariff stand, he outlines the volume of metals con-

(Continued on page 144)

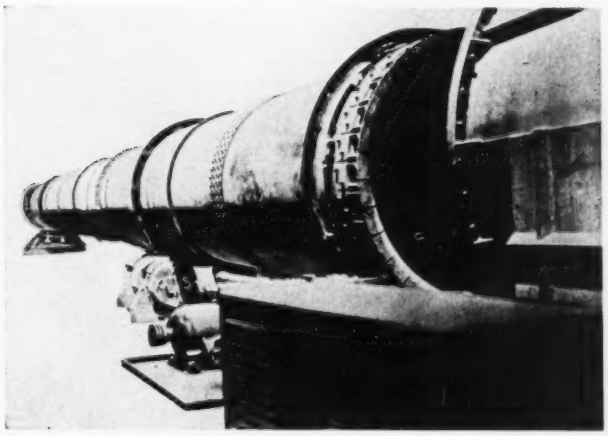
FOR TOP PERFORMANCE..



9' x 11' x 350' Rotary Kiln for Wet Process-Angola.

KENNEDY Machinery and Equipment

LEADS THE FIELD!



From Angola to Ecuador and anywhere in the world where crushing, mining, cement or lime machinery and equipment is used you'll find Kennedy products lead the field. The KVS trade mark on machinery means *the best!* Over the years, in service all over the world, KVS provides *extra* dependability and has earned the confidence of users everywhere.

Our Sales-engineering department can help any producer choose the right machinery and equipment. Consultation with our engineers anywhere, anytime! Get the KVS story first and be sure!

Send for latest KVS Bulletin describing this equipment.

8' x 150' Rotary Kilns equipped with high alloy nose rings.

La Cemento Nacional, Ecuador.

IT COSTS LESS.. TO OWN THE BEST!

KENNEDY - VAN SAUN

MANUFACTURING & ENGINEERING CORPORATION

TWO PARK AVENUE, NEW YORK

FACTORY DANVILLE, PA.

LABOR THIS MONTH

Alan E. Adams, McGraw-Hill Washington News Bureau

MINE-MILL IN THE MIDDLE: The communist issue plagues the Mine-Mill and Smelter Workers union from all sides. Internally, other anti-red locals threaten to split away from the international (following Butte and Anaconda locals); externally, Congress threatens to clamp down on red-led unions through special legislation.

CONGRESSIONAL INTENT: The legislators are impatient to tackle the communist-dominated union problem. When President Eisenhower urged that something be done, he added an impetus that may well bring forth legislation this session. These are the steps so far:

1. The White House proposed that employers be required to sign the NLRB's non-communist oath purely as a stop-gap measure aimed at pleasing organized labor.

2. New bills directed at removing reds from union leadership are still being tossed in the Capitol Hill hopper. The theme is the same in most. Example: A measure by Rep. Lloyd Bentsen, Texas Democrat, calls for special labor panel of Subversive Activities Control Board to ferret out communist-controlled unions. NLRB then would withdraw all services to discovered unions.

NLRB PLEDGES OWN ANTI-RED WAR: Board Chairman Guy Farmer states: "Perhaps the greatest menace to our industrial society in these times is the communist influence in labor unions."

Farmer promises the board will carry fight against red unions to the Supreme Court, describing lower court moves against the board as "stunning legal set-backs." Attempts by the NLRB to have union leaders re-affirm oaths on demand and to withhold certification from unions with officials indicted for false filing were enjoined.

MINE-MILL INTERNAL TROUBLES: Officers concede secession troubles will continue throughout the year. Anticipate threats of new walkouts in Montana, Idaho, and Utah. However, leaders disclaim that moves hurt; describe the break-away by three locals to CIO Steel Workers as "betrayal" of rank-and-file leadership of locals, with the membership refusing to go along.

MORE PROBLEMS: The trial of Mine-Mill international representative Clint Jencks could blow up into big union exposé. With ex-Party members putting the finger on Jencks and other IUMMSW leaders for communist affiliation, it keeps the issue constantly before the public. Jencks was found guilty in an El Paso court in late January of filing a false non-communist oath in April 1950.

MANAGEMENT VERSUS COMMUNIST UNIONS: Brown University professor, Philip Taft, attacks employers for failure to fight red unions. Taft asserts that non-communist trade unionism has cleaned house with "virtually no aid" from employers.

Cites "widespread feeling" that employers have encouraged left-wing unions to play labor organizations against one another. These employers "share the blame for the communist invasion," according to Taft who says, however, that communist influence in the labor movement will continue to decline.

SECRET GOVERNMENT STRIKE BALLOT: The Eisenhower proposal to require a Federal-controlled strike vote would test whether communist leaders really represent the membership. Administration labor experts prefer vote before strike takes effect; unions violently oppose any kind of government vote, particularly a post-strike ballot.

This proposal appears certain to die in the Congressional cutting room. Labor secretary James Mitchell isn't keen on the idea. Neither is Senate labor expert, New York's Irving Ives.

sumption by the most important U.S. export industries.

Other Policy Reports Pending

Two other reports which could have much significance on mining are due soon. Next month, the President's Interagency Mineral Policy Committee, consisting of representatives of Interior, Commerce, State, and ODM, is scheduled to make its report. The following month, the Senate's "Special Subcommittee on Minerals, Materials and Fuels Economics," headed by Sen. Malone, plans to report on its year-long investigation into the stockpile and accessibility of strategic materials to the U.S.

Kennecott Copper's James Boyd, former Bureau of Mines Director, has been a consultant to Commerce Secretary Weeks and his assistant secretaries for domestic and international affairs for their responsibility to the President's mineral policy committee. Interior Secretary McKay, who was designated committee chairman, has delegated much of his function to his assistant secretary for mineral resources, Felix Wormser, former St. Joe Lead vice president.

For the past two months, this column has reported the difficulties facing the committee. The committee, for example, is expected to skirt the foreign trade question, although to most mining people, this is the crucial point in a national policy for minerals. It's understood that the committee will stress such peripheral issues as taxes, conservation, technical assistance, and mobilization planning.

Major consideration in mobilization planning is "maintenance of the mobilization base"—a pet phrase of defense officials. This means keeping essential defense-supporting industries (like mining) in business and on a healthy level.

The Randall report proposed that special defense procurement, rather than tariffs, be used to aid such industries—with the cost charged specifically to the defense budget. The proposal is not relevant to mining, unless a beefed-up stockpile program is in mind. This doesn't seem likely; for the second successive year, the Administration has failed to request more stockpile money in its new budget.

This is one frustrating problem thrown in the lap of the President's mineral policy committee. An even fiercer one: How to correlate a domestic mineral policy advocated by domestic miners with the foreign economic policy worked up by the Randall Commission.

Sen. Malone's task is simpler. He's skipping the peripheral issues, and will center his report on one point: Killing the reciprocal trade program, which the Randall Commission (or at least its majority) wants extended. Malone's influence, however, looks weak. The President's committee, for example, hasn't even bothered to do much coordinating with Malone's staff.

AMSCO MANGANESE STEEL WELDMENTS
ADD NEW LIFE TO WORN EQUIPMENT

Amsco Welding Rods and Electrodes For repair welding of manganese steel shapes to worn equipment, American Manganese Steel Electrodes retain their toughness and give real operating savings.

Amscoating with Amsco Hardfacing Rods increases service life . . . reduces shutdowns.

Contact your Amsco Distributor or write for illustrated catalog WA-77 on Amsco Manganese Steel Weldments and Hardfacing Selector Guide.

Brake Shoe

AMERICAN MANGANESE STEEL DIVISION
376 EAST 14th STREET · CHICAGO HEIGHTS, ILL.

Foundries at Chicago Heights, Ill.; New Castle, Del.; Denver, Colo.; St. Louis, Mo.; Los Angeles, Calif.
Offices in principal cities. In Canada: Joliette Steel Limited, Joliette, Quebec.

Here's news for YOU!

ANNOUNCING

MICHIGAN

TRACTOR SHOVELS

. . . from engine to tires Power Transmission engineered and manufactured by Clark

Faster, heavier, with greater horsepower than any tractor shovels of comparable capacity, MICHIGAN* Tractor Shovels move material faster, last longer and cost less to operate! Check these vital mechanical superiorities . . .

Clark Torque Converter
Clark Power-Shift Transmission
Clark Planetary-Wheel Axles
Hydraulic Steering Booster
Low Level Bucket Tip-Back
Short Turning Radius
High Tractive Ability
Four Speeds Forward
Four Speeds Reverse
Lights — Standard Equipment
Double-Acting Lifting and Dumping Cylinders
Gasoline or Diesel Engine

Six Models . . . To Fit Every Need

Model 12-B—1½ cu. ft. . . . . bucket drive, rear steer
Model 75-B—1 cu. yd. . . . . bucket drive, rear steer
Model 75-R—1 cu. yd. . . . rear drive, bucket steer
Model 75-A—1 cu. yd. all-wheel drive, rear steer
Model 125-A—1⅜ cu. yd. all-wheel drive, rear steer
Model 175-A—2¼ cu. yd. all-wheel drive, rear steer

For Full Information . . .

All the facts concerning these important new machines are assembled in the MICHIGAN Tractor Shovel FACT-FOLIO—a handy and useful file containing specifications and action photographs. The coupon will bring your copy.

*A Trademark of Clark Equipment Company

CLARK EQUIPMENT

CLARK EQUIPMENT COMPANY
Construction Machinery Division 436, Second Street BENTON HARBOR, MICHIGAN, U. S. A.

Please send the MICHIGAN Tractor-Shovel Fact-Folio

Name_____ Title_____

Firm Name_____

Address_____

City_____ Zone_____ State_____

 (*Continued from page 69*)

U. S. Lead Imports Decline in November

Imports of lead into the U.S. declined in November to 29,751 short tons, according to statistics compiled by the American Bureau of Metal Statistics from Bureau of Census reports. This is 58% of the 1952 average monthly rate and 62% of the average monthly rate for the eleven months of 1953.

Imports from Mexico of refined lead declined greatly in the latter half of 1953. They averaged nearly 17,000 tons per month in 1952 and the first eight months of 1953; in November 550 tons were imported from Mexico and in October 1,240 tons. Lead imports in ore in November from Mexico of 213 tons were at about the 1952 rate. Imports in the latter part of 1953 from other suppliers of large tonnages to the U.S. market have not changed much.

Statistics on U.S. imports of lead (lead content), in short tons as compiled by the American Bureau of Metal Statistics, follow:

	1952	Jan.-Nov. 1953	Nov. 1953
Ore, matte, etc.	104,515	152,679	12,590
Base bullion	389	893	7
Pigs and bars	510,720	371,140	17,154
Total	615,624	524,712	29,751

Refined lead imported into the U.S. in short tons, from major supplying countries, follow:

	1952	Jan.-Nov. 1953	Nov. 1953
Mexico	198,872	140,302	550
Canada	104,530	45,696	3,902
Australia	82,801	68,655	6,955
Yugoslavia	53,995	46,849	3,857
Peru	42,169	48,804	1,583
French Morocco	6,669	3,305	1
Others	21,684	17,529	316
Total	510,720	371,140	17,154

Fabricators Deliveries

Shipments of products (copper content) by U.S. fabricators during 1952 and 1953, by months, in tons:

	1952	1953
January	131,988	134,203
February	115,150	123,850
March	116,887	122,908
April	106,109	116,319
May	109,890	126,972
June	107,709	132,615
July	82,419	91,826
August	120,084	113,250
September	123,740	111,805
October	127,120	116,259
November	130,027	102,258
December	119,263	83,652
Total	1,391,477	1,375,869

Stocks of refined copper in the hands of fabricators as December ended totaled 380,881 tons, which compares with 350,804 tons a month previous and 331,499 tons a year ago.

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated

MISCELLANEOUS METALS

Jan. 30, 1954

Aluminum ingot, 99 plus percent, lb.	21½¢.
Antimony, spot, lb., 5 tons and up but less than carload, packed in cases	31.97¢
Bismuth, ton lots, lb.	$2.25
Cadmium, commercial sticks, delivered, lb.	$2.00
Calcium, lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.18
Cobalt, 97 to 99 percent, per lb.	$2.60
Germanium, lb.	$295.00
Indium, troy oz.	$2.25
Lithium, lb., 98 percent	$11.00 @ $14.00
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	60¢.
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	27¢.
Palladium, troy oz.	$22.00 @ $24.00
Platinum (Official quotation wholesale lots) troy oz.	$90.00 @ $92.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$188.00 @ $190.00
Selenium, 99 plus percent, lb.	$4.25 @ $4.75
Silicon, minimum 97 percent, carloads, lb.	18½¢
Tellurium, lb.	$1.75
Thallium, 100 lb. or more, lb.	$12.50
Titanium, 99.3 plus, lb.	$5.00

(a) Includes U. S. duty.

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per unit	$46.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry 44% Cr_2O_3 no ratio	$27.00 @ $32.00
48% Cr_2O_3 3 to 1 ratio	$44.00 @ $54.00
Iron Ore, Lake Superior, Lower Lake ports, long ton: Old Range bessemer (b)	$10.30
Mesabi bessemer (b)	$10.05
Mesabi, non-bessemer (b)	$9.90
Lead (Galena), 80 percent, Joplin, Mo., ton	$159.05
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties $1.08 @ $1.10 c.i.f. U. S. ports, duty extra. Long-term contract nominal at 90c. to 93c., c.i.f. duty extra.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	60¢
Tantalite, 60% concentrate, per lb.	$2.50 @ $3.00
Tungsten Ore, per unit of WO_3 Foreign, 60 percent, c.i.f. U. S. ports, duty extra	$21.00 @ $22.00
Domestic, scheelite, 60 percent f.o.b. mill	$63.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	31¢
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$52.00

(a) F.o.b. port of shipment. (b) Effective July 1, 1953.

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	5½¢.
Cobalt Oxide, 72¼% to 73½%, ceramic grade, per lb.	$1.96 @ $1.97½
Copper Sulphate, 100 lb.	$10.35
Germanium Oxide, lb.	$142.00

ALLOYS

Ferrochrome, 65 to 69 percent, per lb. of Cr contained	24¾¢.
Ferromanganese, 74–76%, net ton, seaboard	$200
Ferromolybdenum, 55 to 65 percent Mo. lb. of Mo. contained	$1.32
Ferrosilicon, 50 percent per lb. of contained Si.	12 4¢.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$3.80
Ferrovanadium, per lb. of V delivered	$3.00 @ $3.25
Silicomanganese, Max. 1½ percent carbon, lb. per contracts	11.4¢.
Spiegeleisen, per long ton, 19 @ 21% grade	$86.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton:	
Crude No. 1	$960 @ $1,500
Crude No. 2	$595 @ $900
Spinning fibers	$321 @ $514
Shingle fibers	$150 @ $200
Paper stock	$109 @ $137
Waste	$77
Shorts	$35 @ $70
Asbestos, f.o.b. Vancouver, B. C. (U. S. funds):	
Spinning fiber, 3-K	(b)$460
Shingle fiber, 4-K	$185
Asbestos, Vermont, f.o.b. Hyde Park:	
Spinning fibers	$279.50 @ $302.00
Shingle stock	$135.00 @ $162.00
Paper stock	$81.50 @ $115.00
Waste, stucco or plaster	$71.40
Refuse or Shorts	$34.00 @ $63.00
Barytes, f.o.b. cars:	
Georgia, crude, per ton	$14.00
Missouri, 94 percent $BaSO_4$, per short ton	$13.25
Bauxite, long ton, f.o.b. point of shipment:	
Domestic, crude, 50 to 52 percent (not dried)	(a) $5.00 @ $5.50
Domestic, chemical, 55 to 58 percent	(a) $8.50 @ $9.05
Domestic, abrasive, 80 to 84 percent	(a)$18.00 @ $18.50
Feldspar, bulk ton:	
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @ $22.25
Glass feldspar, white, 20 mesh	$11.75 @ $12.50
Fluorspar, f.o.b. mines, bulk, 70% effective ton	$42.50
60% effective CaF2	$38.00
Acid 97% concentrate, bulk, ton	$57.50
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00 @ $14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$38.00
Mica—Domestic, f.o.b. mines. Punch 12 to 22¢. per lb. according to size and quality. Sheet clear, 1¼ x 2 inch, 70¢. to 85¢.; 2 x 2 inch, $1.10 to $1.60; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet, ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton Scrap $32 and up.	
Ocher, Georgia, ton, in sacks	$30.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	Not quoted
Sulphur, Texas, mines, long ton	$25.50 @ $27.50
Talc, f.o.b. works, ton:	
New York, purified	$18.50 @ $20.00
Vermont, extra white	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$30.00

(a) Normal. (b) Corrected.

IRON AND STEEL

Pig Iron, gross ton, basic, Valley Furnaces	$56.00
Steel f.o.b. Pittsburgh, billets, net ton	$62.00
Structural shapes, 100 lb.	$4.10 @ $4.15

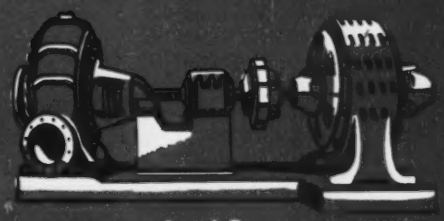
Climax Hydraulic Guns

Log Washers

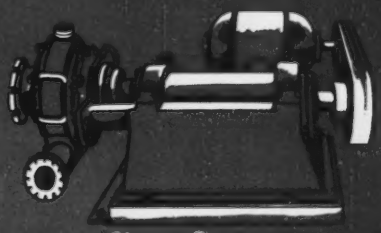
Dredge Swing Gear

Manufacturing Engineers To The Mining Industry

GIW

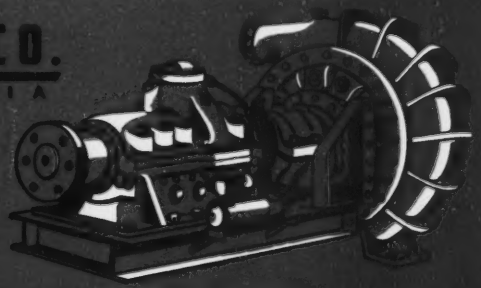


Sand Pumps



Slurry Pumps

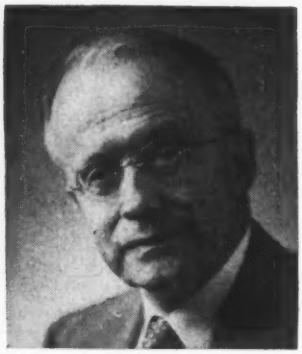
GEORGIA IRON WORKS CO.
EST. 1891
AUGUSTA GEORGIA
605 12th Street



Dredge Pumps

Portable Hydraulic Dredges

PERSONAL NEWS



Allan H. Hubbell, senior associate editor of *Engineering and Mining Journal,* retired from active service with the magazine as of the first of this year. A member of the editorial staff of *E&MJ* since 1917, he has covered in his writings every phase of industry activity.

His most recent editorial service appears in this issue, the "Survey of Mining Practice," an annual feature of the February issue. This survey was originated by Mr. Hubbell several years ago, and has been developed by him to a point where it provides an unequalled review of significant current developments in open pit and underground mining technology.

Readers of *E&MJ* who have become familiar with his byline on articles on major industry developments will be glad to know that Mr. Hubbell's name will continue to appear as an *E&MJ* author. He will do special articles for the magazine from time to time in mining industry fields in which he is most interested and most familiar.

M. E. Volin, Spokane, Wash., Chief of the Bureau of Mines' Region II mining division in the Northwest, has been promoted to Director of Region 5, Minneapolis, Minn., and left Spokane on Jan. 9 for his new location.

Northwest Magnesite Co. has announced the promotion of **Milton Carr,** who has been with its Chewelah, Wash. plant since 1938, to superintendent in charge of operations at its magnesite plant at Cape May, N. J. **Gene Kerns,** who has been with the Chewelah plant for more than 5 years, will also go to Cape May as Carr's assistant.

James Pollock has returned from Toquepala, Peru, and is now with Calumet and Hecla, Inc., as assistant chief geologist, with headquarters at Calumet, Mich.

E. M. Platte, one of the best known men in the mining machinery business and executive vice president of Joy Manufacturing Co. for several years, has been obliged to resign because of failing eyesight, He will continue to serve the company as a consultant.

N. F. Koepel, who has completed 35 years of continuous service with Andes Copper Mining Co. in Chile, was honored at a luncheon at the Santiago offices of the Chile Exploration Co. by a number of executives of the latter firm and of Anglo-Lautaro Nitrate and Braden Copper.

F. J. Haller, manager of Michigan mines for the Cleveland-Cliffs Iron Co., and **C. W. Nicolson** have joined the North Range Mining Co. staff, Mr. Haller as vice president, operations, and Mr. Nicolson as consulting engineer in charge of new development.

Wayne J. Ahl has been appointed mine superintendent of the Greenwood mine of the Inland Steel Co., at Ishpeming, Mich.

Climax Molybdenum Co. has created a new exploration division to be headed by C. J. ABRAMS, who has been general manager of western operations for the firm. The new division will emphasize mineral exploration. Abrams' headquarters will be in Denver. He will be succeeded as general manager of western operations by FRANK COOLBAUGH, who has been resident manager of the company's mine at Climax, Colo. Abrams studied mining engineering at University of California before joining the Climax firm in 1928. Coolbaugh, a Climax employee since 1933, is a graduate of Colorado School of Mines.

HORACE W. HIGGS has been appointed assistant general superintendent of smelting and refining of the Cerro de Pasco Corp. Mr. Higgs will continue to be stationed at La Oroya, Peru, where the corporation's smelting and refining plants are located.

Harold R. Hays has been named superintendent for the U. S. Gypsum Co. plant at Heath, Mont. **R. W. Deneke,** manager announced. Mr. Hays has been mill engineer at the plant.

Albert Mendelsohn, for more than 15 years general manager of Cananea Consolidated Copper Co., S.A., has been elected a vice president and a director of Greene Cananea Copper Co., Cananea Consolidated's parent organization.

Arnold H. Miller, consulting engineer, of New York City, is in Spain on professional assignments and will go from there to North Africa, Italy and France before returning to this country.

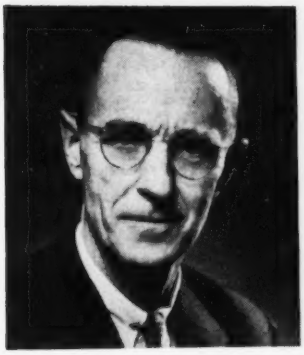
E. W. Felegy, mining engineer, formerly with USBM, at Duluth, was transferred to the bureau office at San Bernardino, Calif. **Roy C. Stott,** mining engineer, has been transferred from Birmingham to Duluth.

Bill Conway, Pickands, Mather & Co. foreman in the Hibbing district, has been transferred to the West Hill mine near Grand Rapids.

W. R. Turkes, professor and head of the department of industrial engineering at the University of Pittsburgh, has been named assistant dean in the Pitt Schools of Engineering and Mines.

M. W. Hotchkin, former manager of Toburn Gold Mines, which wound up this year, and vice president of Asarco Exploration Co., has been appointed director in charge of exploration for Wright-Hargreaves Mines.

Edward Martinez has left the mineral preparation division, Pennsylva-



JAMES B. REDPATH, general manager of Sigma Mines (Quebec) Ltd., and president of the Quebec Metal Mining Assn., has been named executive vice-president of Dome Mines, Ltd., succeeding the late James G. McCrea.

nia State College. to accept a position as research investigator in mineral dressing in the Research department, American Smelting and Refining Co., South Plainfield, N. J.

Andrew Robertson, prominent Canadian mining executive and operator, has been named vice president and manager of Eastern Metals Corp. Ltd., and Eastern Smelting & Refining Co. Ltd.

Miss Betty Ann Harker has joined the Madison laboratories of the Bjorksten Research Laboratories, Inc., as a technical editor.

Dr. George A. Roberts has been named vice president in charge of technology of the Vanadium-Alloys Steel Co., Latrobe, Pa.

A. W. Hoover, office manager of AS&R's northwest mining department at Wallace, Idaho, retired Oct. 31 after 37 years' service. He is succeeded by **W. J. Murphy.**

J. P. Gill, of Vanadium-Alloys Steel Co., has been elected president of the firm, according to an announcement by the board of directors. He succeeds **Roy C. McKenna,** who will continue as chairman of the board in an active capacity.

J. PARNELL CAULFIELD, general manager of Kennecott's western mining divisions, has been elected president of the Utah Mining Association.

Harlan A. Walker, formerly with Homestake Mining Co., and most recently a consultant in Salt Lake City, is now vice president and general manager of Marcona Mining Co., Lima, Peru.

John H. Eggers, mining engineer and geologist, has been elected chairman of the mining branch of the AIME, Southern California section, for the year 1954.

R. A. Brotherton, Negaunee, Mich., mining engineer with Cleveland-Cliffs, was honored with a testimonial dinner on Nov. 12 in recognition of his 50 years with the company.

Prof. Arthur P. Wichmann, professor of metallurgy at the Colorado School of Mines, has been appointed acting head of the Metallurgy Department there.

A. O. Bartell, managing engineer for the Raw Materials Survey for the past six years, has resigned to devote time to consulting work. He will be retained on a part-time basis as consulting engineer.

Lewis A. Ogle has been appointed pit foreman at Oliver Iron Mining Division's Plummer mine at Coleraine in the Canisteo district.

F. F. Redfield has moved from the St Joseph Lead Co. operations in Missouri to become resident manager for Brunswick Mining & Smelting Corp. in Bathurst, New Brunswick, a project in which St. Joe and Anacon Lead Mines, Inc., share an interest.

H. G. Satterthwaite has been transferred from the Anaconda zinc plant at Great Falls, Mont., to become general superintendent of the new Anaconda Aluminum Co. plant at Columbia Falls.

Bunting S. Crocker, former mill superintendent at Lake Shore Mines, Ltd., Kirkland Lake, Ont., is now a consulting metallurgist for Kilborn Engineering Co., Toronto.

George T. Harley, manager of the New Mexico properties of the Potash division of International Minerals & Chemical Corp. since 1944, became consultant for the Potash division on Jan. 1, 1954. Succeeding him as manager is **Carl A. Arend,** who has been assistant manager since July 1, 1951.

Francis Thomas, vice president of Orinoco Mining Co., has been elected president of that U.S. Steel Corp. subsidiary. He succeeds **Mack C. Lake,** internationally-known mining engineer and geologist, who supervised the post-war development of Cerro Bolivar, Venezuela. Mr. Lake continues with USS as a consultant.

Philip D. Wilson, mining engineer and geologist, on Jan. 1 completed arrangements with Lehman Brothers and the Lehman Corp. for his employment for consultation and examination of mines and mining securities for other clients.

FRANK S. WARTMAN of Boulder City, Nev., has been awarded the Department of Interior's highest honor, the Distinguished Service Award, for his part in developing a process for producing titanium.

Henry G. Schuring is now with Atlas Consolidated Mining and Development Co. as mill superintendent of their copper concentrator at Cebu, Philippines. He was formerly mill superintendent at Neptune's Bonanza installations in Nicaragua.

Harry L. Moat has been appointed assistant to the director of operations, explosives department, Atlas Powder Co.

Robert Hughes, general manager of Miami Copper Co., Castle Dome Copper Co., and Copper Cities Mining Co., has been elected vice president of those companies.

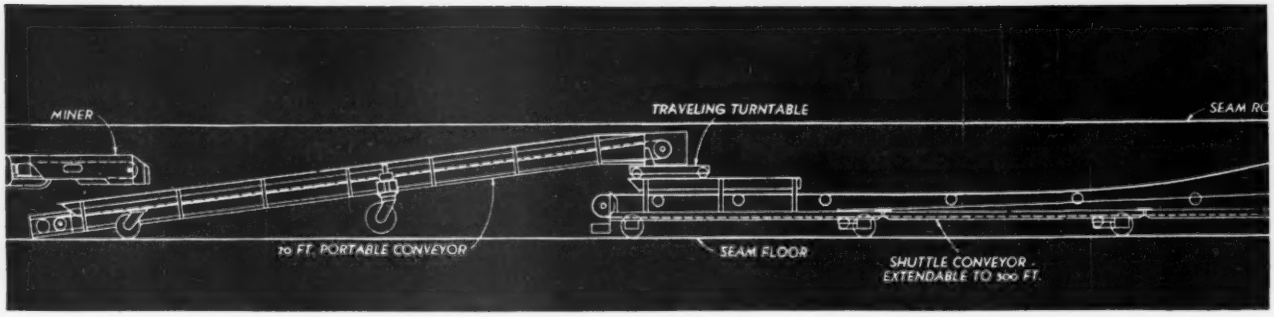
John E. Kelley, natural resources consultant and director of African services for Kerr & Co., has returned from a two months' visit to Spain, where he negotiated for large-scale international trade in minerals with the government of that country. He will return on the same mission in the spring.

H. H. Richardson and **Dana T. Bartholomew** were elected to the board of directors of Aluminium Ltd., and their appointments as vice-presidents of the firm were announced in mid-January. The board also accepted the resignations of **Dr. Earl Blough** and **George O. Morgan,** who retired from active association with the company following long and outstanding careers.

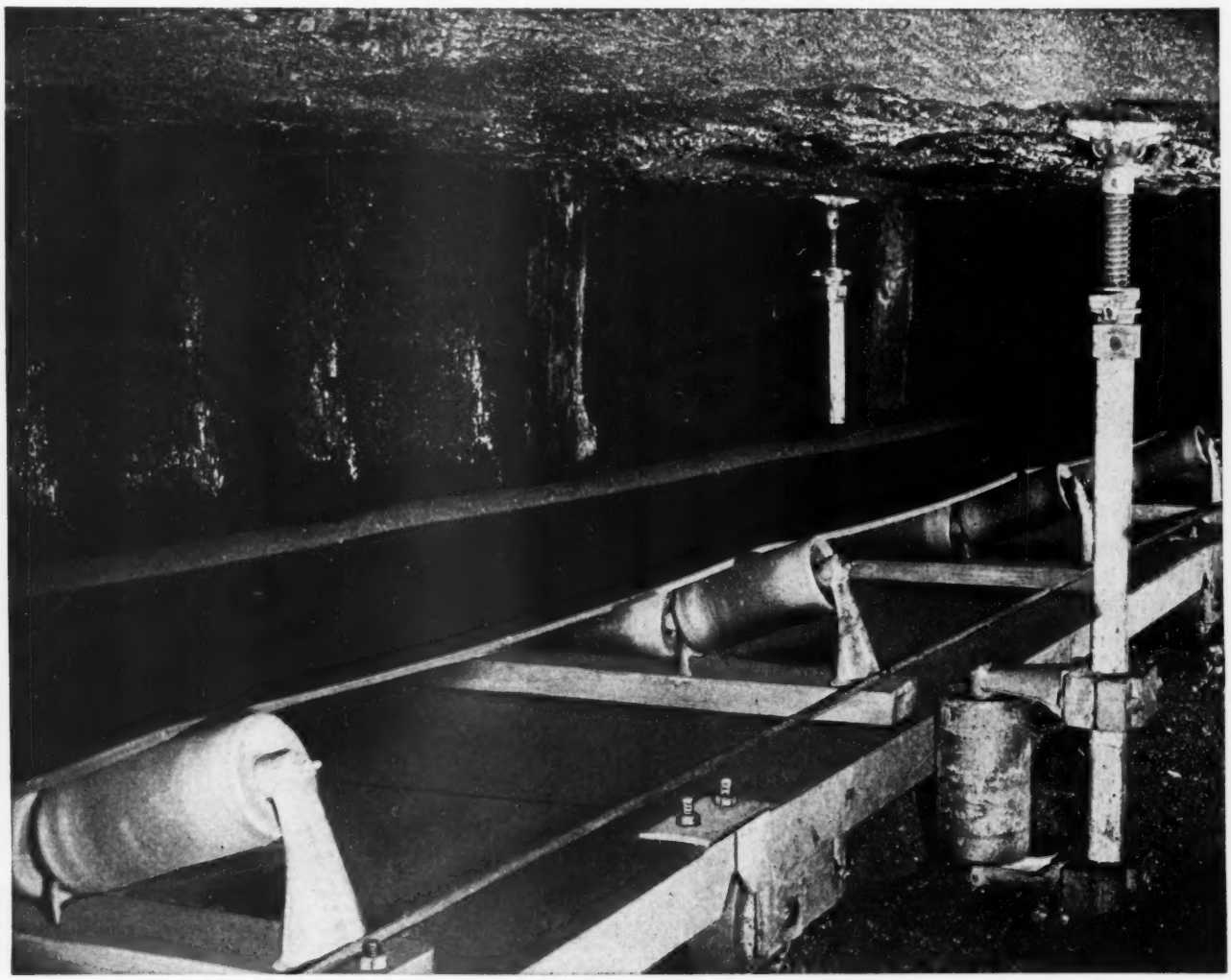
(Continued on page 154)

CORRECTION

The article entitled "Kaiser Streamlines Mining and Processing of Nevada Fluorspar" in the October 1953 issue of *E&MJ* contained a typographical error. On p 98, column three, line 12, the figure given for the amount of oleic acid used for flotation was 75 lb/t. The correct figure for the amount is 0.75 lb/t.

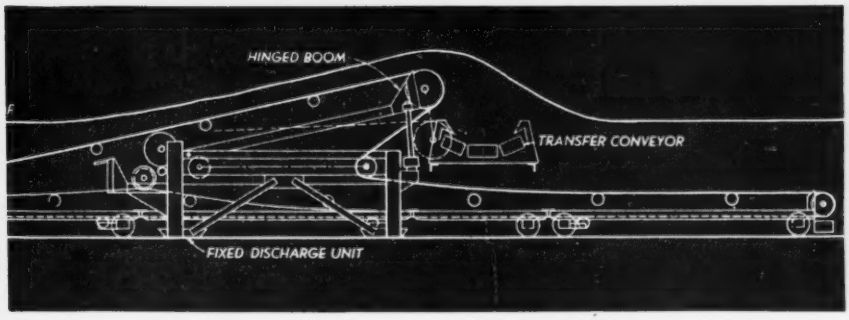


Here's the New Answer to

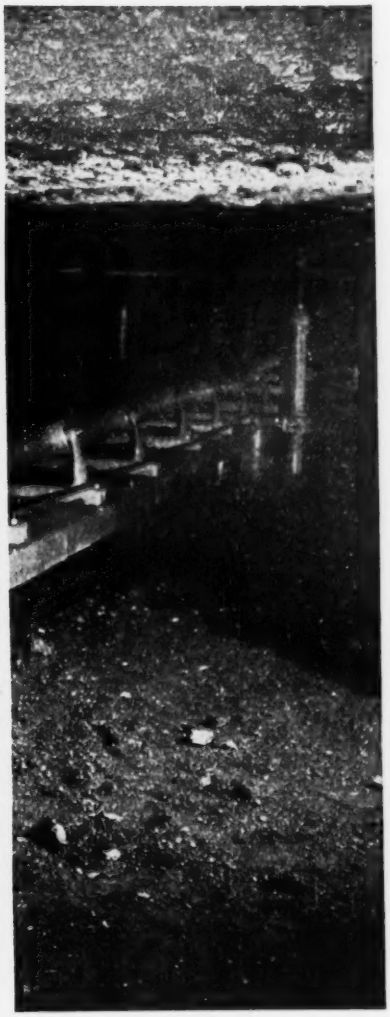


HEWITT-ROBINS

EXECUTIVE OFFICES, STAMFORD, CONNECTICUT



Continuous Mining



It's The Hewitt-Robins Mine Type Shuttle Conveyor With Fixed Tripper

The Hewitt-Robins Mine Type Shuttle Conveyor with fixed tripper forms the final link in a complete belt conveyor system that can handle an uninterrupted flow of ore directly from the face to the surface as fast as any mechanism can produce it.

This versatile unit is the key to truly continuous mining. The Shuttle Conveyor is both extendable and retractable—can follow the progress of mining and at the same time maintain a fixed transfer point through a fixed tripper and is extendable to 600 or 700 feet.

As the working face advances, the Shuttle Conveyor can closely follow the mining machine and receive its load either directly or from an intermediate transportation unit such as shuttle car or loading machine. The Shuttle Conveyor is so designed that alignment can be properly maintained by mounting small guide rollers on standard roof-jacks along each side of the conveyor frame, when operating off-track. When track-mounted, the guides are not required.

Remember, when it comes to any type of belt conveyor or complete belt conveyor systems, only one company—Hewitt-Robins—can assume single and unified responsibility for successful operation. For only Hewitt-Robins designs, engineers, manufactures and installs both the belt and machinery.

Here is a partial list of

HEWITT-ROBINS PRODUCTS

that will help you cut handling costs and increase operating efficiency.

MACHINERY

Belt Conveyors
Belt & Bucket Elevators
Car Shakeouts
Conveyor Idlers
Dewaterizers
Mechanical Feeders
Foundry Shakeouts
Mine Conveyors
Reclaiming Systems
Screen Cloth
Stackers & Trippers
Vibrating Conveyors & Screens

INDUSTRIAL RUBBER PRODUCTS

BELTING:

Conveyor
Elevator
Transmission

HOSE:

Acid
Air & Air Drill
Barge Loading
Dust Suction
Fire
Fuel Oil & Gasoline
Gasoline Pump
Mud Pump Suction
Oil Suction & Discharge
Propane-Butane
Road Builders'
Rotary Drilling
Sand Blast
Sand Suction
Sea Loading
Servall®, All-Service
Steam
Tank Car & Tank Truck
Vacuum & Air Brake
Water & Water Suction
Welding, Twin-Weld®

•

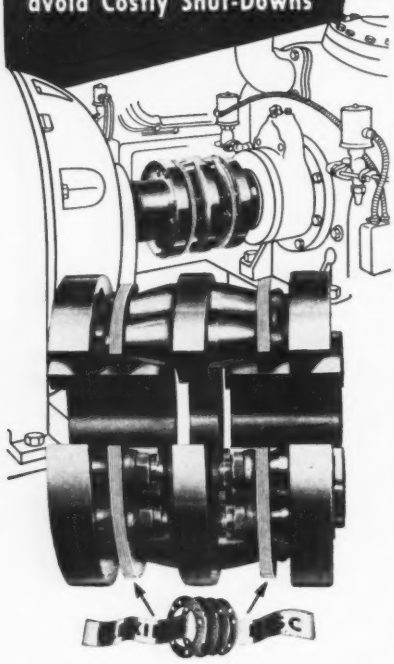
For information and service on industrial rubber products, contact your Hewitt-Robins Industrial Supply Distributor. Through his complete stock of Hewitt-Robins Rubber products, and his familiarity with local field conditions, he can fill your supply needs promptly and correctly. See Classified Phone Book for the Hewitt-Robins Industrial Supply Distributor serving your area.

136

INCORPORATED

DOMESTIC DIVISIONS: Hewitt Rubber • Robins Conveyors • Robins Engineers • Restfoam
FOREIGN SUBSIDIARIES: Hewitt-Robins (Canada) Ltd., Montreal • Hewitt-Robins Internationale, Paris, France • Robins Conveyors (S. A.) Ltd., Johannesburg • **EXPORT DEPARTMENT:** New York City.

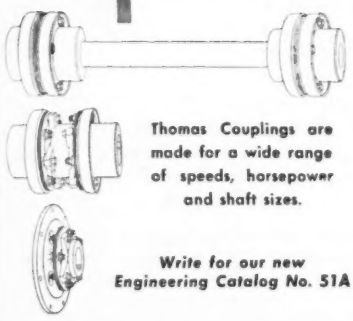
Specify THOMAS ALL METAL
FLEXIBLE COUPLINGS
for Power Transmission to avoid Costly Shut-Downs



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.

DISTINCTIVE ADVANTAGES

FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



Thomas Couplings are made for a wide range of speeds, horsepower and shaft sizes.

Write for our new Engineering Catalog No. 51A

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

Personal News *(Continued)*

OBITUARIES

Charles Boone, 70, former mining engineer associated with Charles Butters & Co. enterprises in California, Chile and Peru, died in December at Berkeley, Calif.

David C. Leggett, consulting engineer for a number of companies in Saskatchewan's Beaverlodge uranium area, died at Uranium City. Son of the late **Thomas H. Leggett,** well known New York mining consultant, he graduated from Yale University in 1928 and had been active in Canadian mining ever since.

Paul Garner, 40, was fatally injured in a 50-ft fall from a scaffold in a U. S. Potash Co. mining shaft near Carlsbad in December. Garner fell while installing guides in the No. 3 shaft of the U. S. Potash Co. He was an employee of the Winston Bros. Construction Co. of Carlsbad.

Robert Fay McElvaney, 72, former vice-president of American Smelting & Refining Co., died recently at his Phoenix, Ariz. home. He had retired in 1949. He began working for American Smelting and Refining Co. in 1903 as assistant chemist at the Tacoma Smelter, Tacoma, Wash.

A. Norman Jette, 49, formerly employed by the Anaconda Copper Co. at Anaconda and in South America, died in Las Vegas, Nev. At the time of his death, Mr. Jette was a member of the staff of the U. S. Bureau of Mines.

T. L. Hartshorn, president of Smith-Bullard Mines, Inc., died Dec. 22 while on a visit to Twin Lakes, Colo. Mr. Hartshorn suffered a heart attack and died before he could be taken to the hospital at Leadville.

Walter Scott (Death Valley Scotty) 81, died Jan. 5 at his home in Death Valley, Calif.

Daniel R. Gittinger, 59, metallurgist for the Bunker Hill & Sullivan Mining and Concentrating Co., died Oct. 16.

George S. Krueger, 68, noted Utah mining man and employee of Park Utah Consolidated Mines for 44 years, died Dec. 26 after a long illness.

APPRECIATIONS

In the passing of **Robert McIntosh,** who died Oct. 17, 1953 at his home in Lake Linden, Mich., his family, his community, and his industry associates have lost a man of an integrity and of a devotion to an ideal of service to society that is becoming increasingly rare.

Not that Mr. McIntosh would ever have chosen such words to describe his feelings. Perhaps he never put them into words, even to himself. But to everyone who knew him, it was apparent that he possessed the highest standards of public, professional, and private behavior, and that he lived up to them.

He was born in Grinnell, Iowa, and graduated from Grinnell College. He later took a degree in mechanical engineering at Cornell University, class of 1905.

Following a period of employment with the Nordberg Manufacturing Co. in Milwaukee, he joined the Calumet & Hecla Consolidated Copper Co. and for many years was a mill superintendent for that company. During the last six years before his retirement in 1951, he was mechanical superintendent for Calumet & Hecla's Northern Michigan properties.

Mr. McIntosh was married in 1906 to Miss Katharine Henderson, a classmate at Grinnell. Their life together was a particularly happy one, developing as it did a mutual respect and affection that was a pleasure to observe.

Mr. McIntosh took an active interest in community affairs, and was for 20 years a member of the Lake Linden-Hubbell school board.

He will always be remembered by his family and his associates as a man of quiet dignity, undeviating loyalty and affection, and of firm belief in the essential rightness of a job well and thoroughly done.

R. H. RAMSEY

Walter I. Garms died at the age of 67 of a heart attack on Dec. 29, 1953, at his residence at 10 De Sabla Road, San Mateo, California. Prior to his retirement in 1951, he was Assistant General Manager of Ray Mines Division of Kennecott Copper Corporation, and in direct charge of its reduction plant at Hayden, Arizona.

He was born and raised in San Francisco, and after graduating from the University of California in 1910 he entered the employ of the Ray Consolidated Copper Company, the predecessor of Kennecott's Ray Mines Division. He first worked at the mine for a few months and then transferred to the milling department at Hayden, where (except for two years of military service in World War I) he remained until his retirement, working his way up through the Mill organization to General Mill Foreman in 1915, Mill Superintendent in 1926 and Assistant General Manager of Ray Mines Division in 1945.

Mr. Garms was interested in all phases of milling operations but particularly in problems pertaining to fine crushing and fine grinding, on which he conducted many experiments, participated in many technical discussions, and wrote several articles embodying his views. He was an able and efficient administrator and executive.

He is survived by his wife, Margaret D. Garms, San Mateo; a son, Walter I. Garms, Jr., Antioch; and a daughter, Mrs. Mary Alice Ramsden, Menlo Park, California.

W. SPROTT BOYD

NOW—JOY offers You an Air Leg with All The Best Features—

Design, field test, redesign, test again—this story has been repeated over and over in the development of the Joy air leg. But the result has been worth the effort—because this Joy air leg contains all these features which extensive field use has indicated were necessary for most efficient, most comfortable operation . . .

1 BUILT-IN FEED CONTROL built into the backhead of the drill, giving an infinitely variable range from as little as two pounds to full line pressure without step-by-step graduation.

2 PUSH-BUTTON PRESSURE RELEASE on the control handle for quick retraction. Also permits reduction of pressure when drilling through soft seams without changing setting of feed control.

3 BALANCED FORWARD PRESSURE by attachment of air leg at horizontal center line of drill to minimize misalignment of drill and steel. Results in longer chuck life.

4 LIGHTWEIGHT, easily assembled and dismantled, easy to move around the mine.

5 A PERFECT PARTNER for the powerful, efficient Joy L-47 drill.

You haven't seen efficient drilling and ease of handling until you've tried this perfectly matched pair. Write for complete information. ● ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.,*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Consult a Joy Engineer

JOY

W&D M

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT

THIS MONTH IN MINING

Roan Antelope White Miners Vote Lifting of Color Bar

THE MINING INDUSTRY'S attention was focused in January on Africa's Copperbelt where future industrial race relations hung in balance.

White mine workers at Roan Antelope Mine voted early in January for removal of the color bar which in effect prohibits Africans from holding more skilled, higher paying jobs.

At the same time, however, the white workers went on record as favoring equal pay for equal work. Many insiders feel that the "equal pay" recommendation is impractical.

A spokesman for the American Metal Co., which holds a 32.65% interest in Roan Antelope, said that his firm definitely welcomes erasing the industrial color bar but views the "equal pay" clause as a "stinger" which would have the end effect of frustrating the African's ambitions.

The American company spokesman gave two reasons for the firm's stand in regard to the "equal pay" clause:

"First, by equal pay the white mine workers mean also equal housing and other perquisites. The Copperbelt white mine workers' standards of pay and living surpass those found anywhere else in the world. They are artificially high, the outgrowth of inducements that had to be offered a quarter century ago to white miners to emigrate to the Copperbelt—then a far less healthy and attractive community than it is today.

"The second reason," he continued, "is that the overwhelming majority of Africans, denied a chance for responsibility by the white mine workers, are far less efficient. The development of equal efficiency will require a period of years. Meanwhile, under the equal pay principle, the white managers would, to protect costs, be obliged to give preference to the more efficient white man.

"Nevertheless," he added, "we are now and shall continue to work for a practicable solution wherein the African can assume positions of greater responsibility."

Four major mines dominate the Copperbelt. These four mines employ about 4,500 whites and 35,000-40,000 Africans. Of these, Roan Antelope accounts for about 1500 whites and some 9,000 Africans. The remaining three mines, or mining firms, are the Mufulira Copper Mines Ltd. in which American Metal Co. holds a 32.43% interest; N'changa Consolidated Copper Mines Ltd. and Rhokana Corp., Ltd., which operates the N'kana Mine.

N'changa and Rhokana are affiliated with Anglo-American Corp. of which the famous Sir Ernest Oppenheimer is chairman and permanent director.

In a Christmas statement, Sir Ernest asked the European Mine Workers Union of Northern Rhodesia to discuss ways and means of enabling African mine workers to take jobs of greater responsibility.

This statement was attacked by Gert Lombaard who, speaking for the South African white gold miners' union, called upon white miners to resist the move.

Some observers felt that since the question of the industrial color bar had been brought forward for airing, some change certainly would result. But rather than anything spectacular, they looked for a very gradual assumption of more responsibility by the African. They envisioned the shift as a long-range proposition.

Northern Rhodesia is rated as the world's third largest copper producing area. The four major companies in 1952 produced 350,000 short tons of electrolytic shapes and blister copper.

(For a more complete discussion of Northern Rhodesia as a copper producer, see *E&MJ*, July 1953, p. 82-87.)

1953 United States Mineral Production Greatest in History—Exceeds $14 Billion

MINERAL PRODUCTION in the continental U.S. during 1953 was the greatest in history.

Total value is estimated at $14,346 million, 7% higher than in 1952, according to a summary released last week by Secretary of the Interior Douglas McKay.

Largest gain was in fuels, but production of nonmetallic minerals and metals also rose.

The value of mineral production for 1952 and 1953, as estimated by the staff of the Bureau of Mines, follows:

	(a) 1952	(a) 1953
Nonmetallic minerals:		
Fuels	9,616,000,000	10,189,000,000
Other	2,212,000,000	2,380,000,000
	11,828,000,000	12,569,000,000
Metals	1,602,000,000	1,777,000,000
Grand total	$13,430,000,000	$14,346,000,000

(a) Preliminary figures.

Domestic mine output of copper of about 926,000 tons in 1953 merely maintained the level of 1952, with defense stimulation delayed for the most part until 1954. The maintenance of an abnormally high price for Chilean copper resulted in a drop in imports from that country.

Although slab zinc consumption in the United States during 1953 reached the all-time high of about 1-million tons, domestic mine production was only 540,000 tons, the lowest since 1938. Many mines were closed or operated on a reduced schedule. Imports reached a new high, totaling about 525,000 tons of zinc in ores and concentrates and 230,000 tons of slab zinc.

During 1953, domestic mines produced about 340,000 tons of recoverable lead, compared with 390,000 tons in 1952. Secondary smelter output of lead was about 450,000 tons, against 471,000 tons in the preceding year. Imports totaled 545,000 tons, compared with 542,000 in 1952.

Domestic producers of lead and zinc, particularly zinc, sought support of their market by tariff, quotas, and other means. At least three Government committees were studying the situation with a view to making recommendations early in 1954.

Primary aluminum production totaled 1,250,000 tons, far above that of any other year. Plans for a third round of Government-assisted expansion of the industry were not completed.

Beryllium supply exceeded demand during 1953. New supply was the greatest in history. Domestic production was less than 10% of total new supply.

Production of lithium minerals continued to increase, reaching an all-time high.

Shipments of 117-million tons of iron ore in 1953 were 20% higher than in 1952.

Domestic production of manganese ore, stimulated by the purchase program, increased to 160,000 tons in 1953, against 116,300 tons in 1952.

Chrome Ore Mill Completed

Vanadium Corporation of America announced in January that its new mill for concentrating chrome ore in Southern Rhodesia has been completed and is in production. Through its wholly owned subsidiary, the Rhodesian Vanadium Corp., it owns extensive deposits of chrome ore in Southern Rhodesia.

NICARO NICKEL PLANT, about 450 mi east of Havana on the northern shore of Cuba, soon will be adding about 15% to the free world's supply of nickel. This United States Government-owned nickel plant is built around the lip of Levisa Bay, shown in the background. It is operated by Nickel Processing Corp. in which National Lead Co. owns the majority interest. A World War II project, the plant was shut down in March 1947 after having produced 63,571,414 lb in 40 months of operation. With the Korean crisis, the plant was reactivated. Annual production rate has now risen from about 24-million lb during 1945-46 to the current rate of 27-million lb. Nicaro product is a green nickel oxide.

ODM Backs 75% Nicaro Nickel Expansion

THE CAPACITY of the Government-owned nickel plant at Nicaro, Cuba, will be increased by 75% under a new program announced last week by Edmund F. Mansure, administrator of General Services. The plans also call for financial assistance to promising research in nickel metallurgy.

Office of Defense Mobilization certification has made available $43-million to enlarge Nicaro's capacity and has earmarked $1-million as a research fund.

"The new program will lay the foundation for extending the production of nickel for an indefinite period," Mr. Mansure said. "In this respect, it differs from some earlier expansion programs which contracted for the delivery of definite quantities of nickel over varying terms of years."

"This is a goal," he said, "in which the United States and Cuba have been in full accord—not only to develop a reliable source of vital defense metals, but also to broaden and strengthen the economic base in both countries.

"In rehabilitating and operating Nicaro, GSA has had earnest, abiding cooperation in Cuba—by the national government, by private industry, and by labor. For this reason we are confident that the Nicaro expansion will be advanced smoothly and quickly to its goal.

"The size and scope reflect the fact that nickel remains a vital commodity in short supply. Therefore, we face the challenge of building our sources of production to the level at which supplies will equal the combined military, stockpile, and civilian requirements."

DMEA Signs 63 New Pacts For $1,017,982 In Aid

DMEA SIGNED 63 new contracts to provide Government assistance in the exploration for strategic metals in the four-month period ending in November.

C. O. Mittendorf, DMEA administrator, said that in the 63 August-November signings, the Government agreed to supply up to $1,017,982 of the estimated total costs of $1,722,254.

The new contracts brought to 606 the number of contracts executed since the DMEA program was launched two years ago. Of these, 331 were in force Nov. 30.

Mining Calendar

AIME National Convention, Hotels Statler and McAlpin, New York City, Feb. 14-18

American Society for Metals, Hotel Statler, Boston, March 4-5

Pacific Northwest Metals and Minerals Conference, April 29, 30, May 1, Multnomah Hotel, Portland, Oregon.

Michigan Engineering Society, Jackson, Mich., May 7-8

National Metal Congress, National Metal Exposition, Palmer House, Chicago, Nov. 1-5

News Highlights

Three Arizona firms have entered the minerals research field in that state. **Page 164.**

Central Eureka Corp., San Jose, Calif., has announced plans to spend $500,000 on a two-year development program. **Page 165.**

Sunshine Mining Co. is installing all new flotation equipment in its 1100-ton concentrator near Wallace, Ida. **Page 167.**

White Pine Copper Co. plans to begin production by November 1. **Page 172.**

Oliver Iron Mining Division of U. S. Steel has just concluded the biggest mining season in its 61-year history. **Page 174.**

Some $3½-million changed hands in the two largest uranium property purchases in Colorado Plateau history. **Page 180.**

A new base metal camp for Ontario is a distinct possibility according to recent diamond drillings on Geco Mines' property on Manitouwadge Lake. **Page 184.**

Cassiar Asbestos Corp. has announced that British Columbia exploration has uncovered an estimated seven million tons of asbestos ore. **Page 188.**

Kennecott Copper Corp. reportedly has advanced additional loan capital of $14-million to the Merriespruit Gold Mine in the Orange Free State. **Page 192.**

What is said to be the first Frasch process sulphur ever to be produced outside the U. S. is streaming from a Mexico property. **Page 194.**

Patino Mines & Enterprises Consolidated Inc. retains little hope of resuming operation of its Bolivian tin mines. **Page 198.**

Texas Gulf Sulphur Co. was reported as being near to signing an agreement for development of sulphur resources in Iraq. **Page 199.**

Russia's Urals area copper industry apparently is in the doghouse. **Page 200.**

India is investigating the possibility of producing sulphur from native pyrites. **Page 201.**

Sweden is preparing for a major expansion of iron ore output by 1955. **Page 205.**

Shortage of capital may bring lead prospecting in Greenland to a standstill. **Page 206.**

Latest E&MJ reviews of new books. **Page 210.**

First shipload of iron ore from U. S. Steel's Cerro Bolivar deposit sails from Venezuela. **Page 215.**

RAIL LINK between Lynn Lake, Manitoba, site of new nickel-copper project of Sherritt Gordon Mines, Ltd., and main line closes Nov. 9, 1953, as Donald Gordon, president of Canadian National Railways, drives last spike in new 144-mi line from Sherridon. S. F. Dingle, vice-president, CNR, braces tie; to Mr. Gordon's right are: C. A. Pitts, contractor; W. J. Matthews, Department of Transport, Ottawa; Hon. Stuart Garson, Canadian Federal Minister of Justice; Hon. C. E. Greenley, Provincial Minister of Labor; Hon. Ron Turner, Provincial Treasurer; Eldon L. Brown, president of Sherritt Gordon. Mr. Gordon missed this one, but connected on next, as crowd cheered.

Engineering & Mining Journal Staff Photographs.

Lynn Lake—Last Spike, First Ore

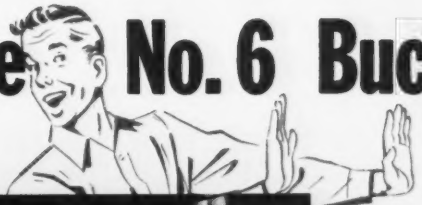
Sherritt Gordon's New Mine Enters Production

OUTCROP that led to Lynn Lake's copper-nickel orebodies is pointed out by Austin McVeigh, the prospector who found it. This is the only nickel-bearing outcrop in the area; geophysical work and drilling outlined the orebodies.

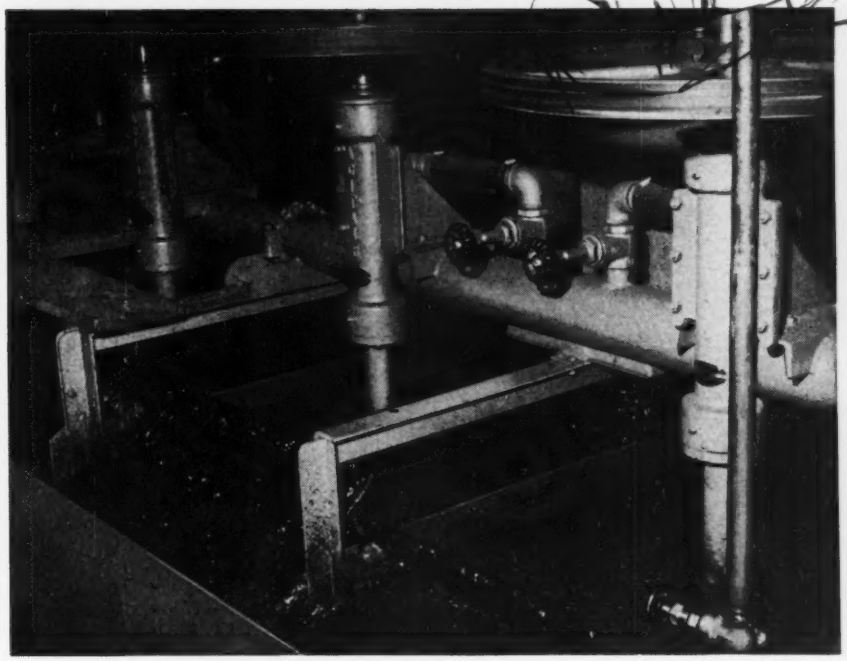
HIGH GRADE ORE is examined by Eldon Brown, Sherritt's president, in drift in "El" orebody. Face is practically solid chalcopyrite, pyrrhotite, and pentlandite.

(*Continued on p. 160*)

They used to pass the No. 6 Buck



Heavy matt of coal moving rapidly through No. 48 Agitair cells.



...now AGITAIR recovers the fines

Long regarded as waste, -28 mesh Anthracite fines — commonly known as "No. 6 Buck" — are now being profitably treated by Erie Concentrator Coal Co. of Avoca, Pa. Froth flotation, applied by the famed Agitair machine, has proved to be the long-sought answer to a challenging problem of waste in the coal industry.

Galigher engineers, collaborating with mine men, worked out the practical method of salvage — with feed capacity of 30 tons per hour, ash content of product 11%.

This triumph in recovery is typical of a wide diversity of Agitair installations that are serving both the non-metallic and the metals industries throughout the world. In each instance, pilot plant precision has been carried over to mill operation. Agitair is the versatile machine that adapts to the specific job, serves dependably and stands up under long, hard use.

Inquiries are invited. Literature free on request.

Leaders in Experience & Service

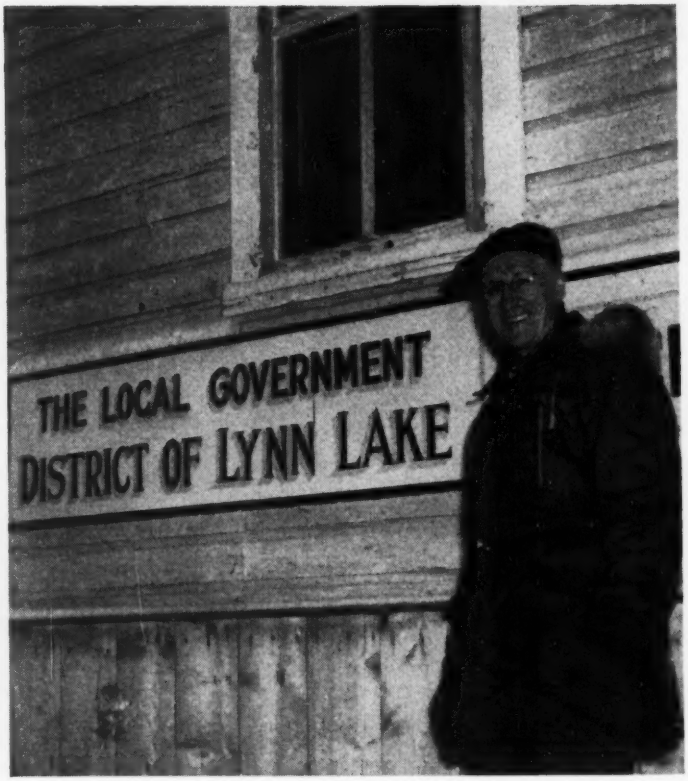
THE GALIGHER CO.

METALLURGICAL DIVISION • ENGINEERING SERVICE

CONSULTATION • ORE TESTING
PLANT DESIGN • GEOLOGIC INVESTIGATION

HOME OFFICE: 545 West 8th South - Salt Lake City, Utah - P. O. Box 209
EASTERN OFFICE: 921 Bergen Avenue - Jersey City, New Jersey
Agents In All Principal Foreign Mining Districts

NICKEL-BEARING SULPHIDE (pentlandite) is pointed out by Ross Muter, mine superintendent. Lynn Lake reserves total over 14-million tons of ore carrying about 1.2% nickel.



NEW TOWN of Lynn Lake is old town of Sherridon moved 150 mi north on sleds hauled by tractors of Patricia Transportation Co. C. R. Neeley, administrator of Local Government District of Lynn Lake, arranged smooth transfer of 220 families, houses and stores.

FIRST COPPER CONCENTRATE drops into launder of last cleaner cell under eye of R. T. Drake, Sherritt mill superintendent. Flowsheet includes bulk sulphide float, followed by cleaning, then re-cleaning in which cyanide, plus heat, separates nickel and copper products.

THE FIRST CARLOAD of nickel concentrate was ready Nov. 12. Alan Gallie, general superintendent at Lynn Lake, checks arrangements for getting car on way to Edmonton refinery.

EASTON®

another EASTON user gets the LOW-COST HAUL . . .

Easton TP Trailer – The standard EASTON pan-type trailer. Capacities from 14 to 20 tons. Used singly or in combination. Standard EASTON axle and fifth wheel. Durable doorless construction – no hoist or other moving parts. Works with the truck or tractor of your choice. The same bodies may also be truck-mounted. Built for the *low-cost haul* in mines and quarries.

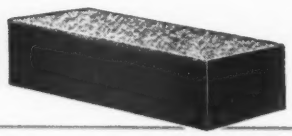
Easton HE-20 Hoist – The standard EASTON electric overhead hoist for EASTON TP trailers and BP bodies. Visible stop-and-hold feed. Remote push-button control. Operated by the crusher attendant. Eliminates need for separate unit hoists. Hoist assembly as supplied includes electric winch, A-frame and hook, cable, and controls. Job-fitted for low-cost dependability.

EASTON CAR & CONSTRUCTION COMPANY • EASTON, PA. B-1060

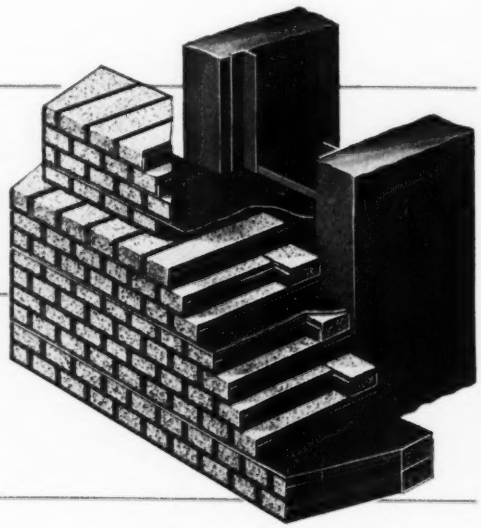
HARBISON-WALKER

CHROMEX B—an extremely hard fired chrome-magnesite refractory having unusual constancy of volume and strength at high temperatures.

METALKASE—the pioneer metal-encased basic brick possessing an unusual combination of desirable properties.



CHROMEX—a chemically-bonded chrome-magnesite brick having excellent spalling resistance.



Typical section of open-hearth furnace front wall built of METALKASE. For maximum stability steel plates are used at every fourth course vertically. These are tack-welded to steel bars which in turn extend behind the buckstay and are free to move vertically.

MAGNEX—a chemically-bonded magnesite-chrome brick—highly basic and of low spalling tendency.

H-W MAGNESITE—the standard burned magnesite refractory for more than half a century.

THERMAG—a hard burned magnesite-chrome refractory possessing enhanced physical properties.

H-W CHROME—a hard burned chrome brick especially adapted for various specific uses.

FORSTERITE—the only commercially produced magnesium-silicate brick—suited for certain particular applications.

H-W PERIKLASE—an exceptional high-magnesia brick of unusual high-temperature stability.

OTHER HARBISON-WALKER BASIC REFRACTORIES

H-W Magnamix
H-W Washington Dead Burned Magnesite Grains
H-W Washington Furnace Magnesite
H-W Special Furnace Chrome
Plastic Thermolith Batch
Thermolith and Other Cements

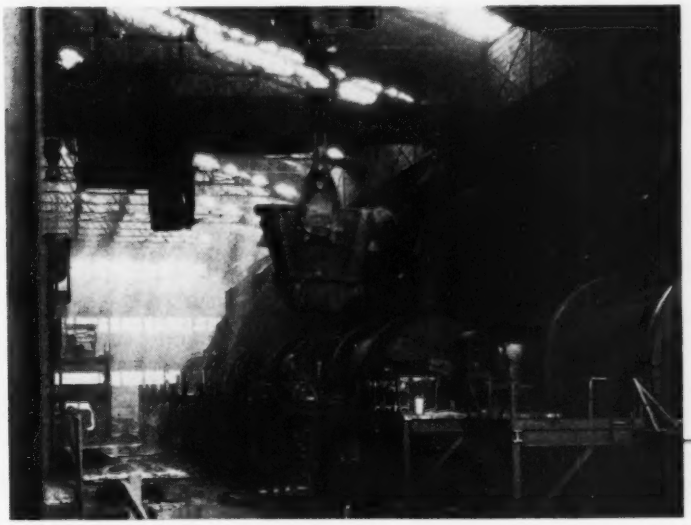
BASIC REFRACTORIES

serve the varied and specialized needs for metallurgical furnaces

Shown at the left are the various brands of Harbison-Walker basic refractories. They include classes especially suited for each particular need in furnaces for smelting ores, refining metals and manufacturing alloys.

Among the brands listed here are types and classes established as standards for furnaces employed in the metallurgy of ferrous and non-ferrous metals and alloys.

The superior performance of Harbison-Walker basic refractories is the result of: (1) a thorough knowledge of the requirements gained through close cooperation with producers of metals and alloys; (2) extensive and continuous original research; and (3) the use of top quality raw materials processed in modern plants under close laboratory control. Harbison-Walker uses the most up-to-date methods and equipment to insure the quality and dependable uniformity of basic refractories.



(*Above*) In basic linings of electric furnaces, METALKASE are used in the upper side walls and provide maximum resistance to spalling and to slagging action. Lower side walls and subbottom are built of H-W MAGNESITE. MAGNAMIX or H-W DEAD BURNED MAGNESITE forms the monolithic banks and bottom.

Two popular brands of basic brick for copper converters are H-W MAGNESITE and CHROMEX B.

HARBISON-WALKER REFRACTORIES CO.

AND SUBSIDIARIES

World's Largest Producer of Refractories

GENERAL OFFICES • PITTSBURGH 22, PENNSYLVANIA

YOU CAN TAKE IT WITH YOU

It's no problem to take along the air you need for underground operations. Naylor pipe makes it an easy matter to "take it with you". This distinctive light-weight pipe is easy to handle and install — particularly when you use Naylor Wedge-Lock couplings to assemble the line. Sizes range from 4" to 30" in diameter to take care of any push-pull ventilating requirements. Naylor pipe is also made for "high air" and water lines.

Write for Bulletin No. 507 on line pipe and Bulletin No. 514 on Wedge-Lock couplings for vent pipe service.

NAYLOR PIPE

Naylor Pipe Company • 1243 East 92nd Street, Chicago 19, Illinois

Eastern U.S. and Foreign Sales Office: 350 Madison Avenue, New York 17, New York

IN THE U. S.

ALASKA

● **Tunneling and crosscutting on the Mertie Lode has opened a large deposit of nickel-copper-cobalt ore** at Funter Bay, on Admiralty Island, according to Henry Roden, president of Admiralty-Alaska Gold Mining Co.

The Mertie Lode is reported to have a 140-ft width on the 1625-ft level. Strike length is undetermined. Recent exploration has encountered the Mertie Lode on the 1450-ft level, 570 ft from the new portal, thus indicating a footwall dip of 38 deg to the east.

Exploration in 1953 revealed also a flat-lying massive sulphide deposit in the new crosscut 80 ft west of the Mertie Lode. It has been exposed in the back over an area of 15x50 ft. Vertical thickness has not yet been fully determined, but drill holes indicated a thickness of 12 ft in some places.

A 100-ton pilot mill has concentrated some 2000 tons from this and nearby deposits with assays reported to average about $40 per ton. Ore contains gold and silver in addition to copper, nickel, and cobalt. Recent assays indicate that nickel may run 2%, copper about 4%, and cobalt possibly 0.5%.

The company has been working on a $108,000 DMEA loan negotiated in 1951. U. S. Bureau of Mines, U. S. Geological Survey, and Alaska Department of Mines have been cooperating in this project. Work has been directed by W. S. Pekovich, general manager of the Admiralty company.

ARIZONA

● **Three Arizona firms have entered the minerals research field** in the state. Arizona Research Consultants, Inc., offers services of professional scientists in development, improvement, and analysis of resources and products in all technical fields. Pantano Exploration Co., will prospect for, examine, test, own, lease, and operate mining, oil and timber properties. Jemm Oil Co. proposes to own, lease, and operate oil and gas properties with mineral exploration as a sideline.

● **Following shutdown of the Castle Dome Copper Co.,** subsidiary of Miami Copper Co., due to ore depletion, the 325-man company crew went to work dismantling the Copper Dome plant and moving it to the Copper Cities Mining Co. property, another Miami subsidiary. Under development for three years, Copper Cities will be in full production by 1955. Plans call for the start of production during the third quarter of 1954. Excavations already have been made, foundations laid for a milling plant, and more

than 4,500,000 tons of waste removed to expose the ore body.

● **Lead-zinc operation shutdowns in Pima County** have resulted in sharp valuation reductions. The Eagle Picher Co. mine, for instance, was reportedly dropped from $200,000 to $3,100. Similar reductions are expected for the 34 lead-zinc mines which have been forced to close operations in the state.

ARKANSAS

● **Aluminum production at Reynolds Metals Co.'s reduction plant at Arkadelphia** was reported in January as being just about to get underway. Total cost of the operation was set at $33-million.

CALIFORNIA

● **Great Lakes Carbon Corp.** has been granted a permit to mine diatomaceous earth in the Palos Verdes Peninsula in greater Los Angeles. After four hearings at which spokesmen for property owner groups in the area vigorously protested the permit, the Los Angeles County Board of Supervisors decided in favor of the company on Dec. 29.

In spite of the fact that some of the protesting property owners have threatened to appeal the supervisors' decision in the courts, Great Lakes promptly exercised its option on the stock of the Palos Verdes Development Corp., thereby acquiring a 6,800 acre parcel of land that includes the 165-acre parcel with the 165-acre quarry site. Purchase price was reported as $9-million.

Great Lakes has announced elaborate plans for a residential development project on its newly acquired real estate.

The supervisors made their decision after an opinion was rendered by the county health officer that the mine would not present a health hazard. They attached 16 conditions to the permit, requiring the company to fulfill certain requirements in operating and screening the mine, and making the permit subject to renewal after five years.

● **Central Eureka Corp., San Jose, has announced plans to spend $500,000 on a 2-yr development program** designed to expand the output of its Central Eureka gold mine, on Sutter Creek in Amador County, to 500 tons a day.

Plans call for diamond drilling and shaft extension. At present the mine has vertical shafts extending 4150 and 4800 ft. The engineering phase of the program has been completed by Robert E. McDonald, a consultant.

A spokesman for Central Eureka said his firm is conferring with Utah Construction Co. on a proposal for the two companies to conduct the development work as a joint venture,

3 good reasons why you can depend on JKS Diamond Drill Bits

for BLAST HOLES
FOUNDATION TESTING
EXPLORATION DRILLING
GROUT HOLES

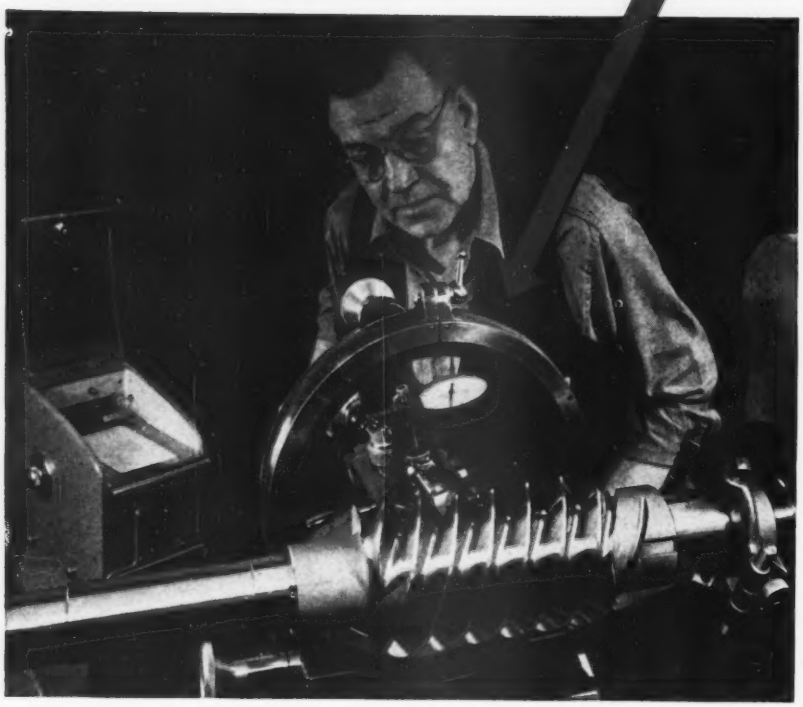
1 Proven designs in three distinct powdered metal matrices for various drilling conditions.

2 Careful grading and selection of diamond quality and size to meet all conditions.

3 Dependable delivery.

J. K. SMIT & SONS, INC.
MURRAY HILL, NEW JERSEY
Other Plants in
LONDON, PARIS, AMSTERDAM, and TORONTO, CANADA

If your worm gear drive passes this test...



it must be a CLEVELAND

THIS precision testing machine analyzes a worm's profile. It detects the slightest deviation in form and lead from thread to thread.

That's important. Unless worm contours match exactly those of the mating gear, you can expect drive troubles—undue wear, unwanted speed fluctuations, ragged drive performance.

Cutaway shows compact interior design and construction of a typical Cleveland worm gear speed reducer.

EVERY CLEVELAND PASSES THIS TEST

More than that, each Cleveland worm must pass this test within microscopic tolerances! This guarantees a perfect match between wear-resistant case-hardened steel worm and nickel-bronze gear. No wonder experience shows that Cleveland worm gear speed reducers usually outlast the life of the machines they drive.

Why not ask the Cleveland representative who serves you to explain all the advantages of America's most dependable worm gear drive and see how it can help you? Write for Catalog 400. The Cleveland Worm and Gear Company, 3281 East 80th Street, Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.

CLEVELAND
Worm Gear
Speed Reducers

California *(Continued)*

Utah Construction obtaining a certain percentage of the mine ownership. However, the firm also is discussing the development project with other construction firms, and the work may be done on a contract basis.

No new vein has been discovered at the mine; the portions now being worked have been producing continuously for 20 years.

COLORADO

● **Wannamaker Mining & Milling Co.** at Saguache completed development work at its Sky City mine that opened up a vein of gold and silver bearing ores. W. M. Dickerson, company president, said that the rich strike was made when the miners completed a cross cut at the bottom of a shaft.

● **Atomic Energy Commission has issued a new request for bids** covering a minimum of 10,000 ft and a maximum of 15,000 ft of dry, non-core drilling to be performed in the Gas Hill Area, Wind River Basin, Fremont County, Wyoming. Bid forms and specifications were obtained by writing to the U.S. Atomic Energy Commission, P O Box 7647, Lakewood Branch, Denver.

● **Weld-Warner Finding Co.** of Aspen has started to work on the Toplift Mine at Aspen. Frank Willoughby of Aspen who leased this mine has commissioned the Finding company to open the tunnel and to do some sampling work.

● **Four Corners Uranium Corp.**, headed by E. H. Sanders, U.S. National Bank Bldg., Denver, purchased 191 claims in the Bull Cañon area of Southwest Colorado from D. Williams of Norwood and associates. The price was disclosed only as "in excess of a million dollars" by Stephen L. R. McNichols, attorney who handled the transaction and one of the stockholders in the claims.

● **Golden Cycle Corp. began production of uranium ore** near Uravan last month, it was reported at Cripple Creek by Max Bowen, vice president. Bowen said the shaft had been sunk to a depth of about 635 ft, a sump had been cut and that workmen were cutting a station in preparation for mining the uranium ore. Ben Slothower, formerly of Cripple Creek, now of Uravan, is superintendent in charge. Several diamond drill holes had been put down in the general area before the shaft was sunk.

● **A new strike at the Henrietta Mine** by Charles Moore and George Bingle of Silverton is said to be some of the richest lead ore shipped from the San Juan country. The third load went to the Leadville smelter last week. Ore comes from the Surprise Vein. Mine is owned by the U.S. Metals Corp. Smelter sheets on the most recent lot sent to the smelter showed 74.4 lead, 35.2 silver, .02 gold, Bingle said.

IDAHO

● **Discovery of high-grade tungsten ore** in a claim near Patterson has been reported. Credit for the discovery goes to Carroll W. Wells, veteran prospector, of Salmon.

Mining men in the area are said to believe that the discovery will open a new major tungsten field. The claim is owned by Mrs. Gladys McDonald of Salmon and Lawrence Gini of Challis.

The vein is now uncovered, showing a long strip of ore. Reportedly, the ore runs high in silver also.

Many miners in the past 40 years have tried to discover high-grade lodes in the Beverly Ann claims northwest of Patterson, leaving scars of open cuts, drifts and shafts work as reminders of their vain attempts.

Prospecting which led to the discovery had been conducted for the past several months by Wells.

● **Sunshine Mining Co. is installing all new flotation equipment** in its 1,100-ton concentrator on Big Creek between Wallace and Kellogg. The 48 old Denver machines are being replaced by 30 new Fagergren cells and 6 Agitair cells in a two-circuit arrangement. Ten Fagergrens will serve as a primary silver-copper circuit; the other 20 will make up the lead-iron bank. The Agitair cells will be a retreatment unit for the silver-copper product, to depress any lead content and return it to the other circuit.

Installation of the modern facilities, which reportedly involves an expenditure of about $80,000, will increase the plant's flotation capacity and result in greater efficiency in the use of reagents.

● **Lucky Friday Silver-Lead Mines Co. is giving priority to raising out a new three-compartment shaft** in order to eliminate principal bottle-neck to present operations — the small main shaft.

The three-compartment offset winze now extends from about 70 ft above the 1800-ft level to the 2400-ft level. Production is now being pushed on the 2000-ft level to open sufficient ground for backfill so that waste rock will not have to be hoisted when raise work is resumed.

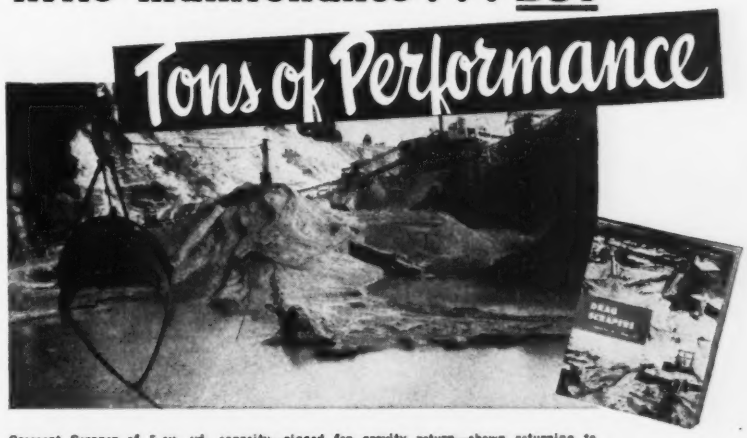
Opening of the main ore body on the new 2300-ft level is proceeding steadily, with the grade and width well up to expectations in the several hundred feet of drift work that have been completed.

A mill run of stockpile ore has been in progress since early November at Golconda Lead Mines' custom mill. Mill heads are averaging better than 9% lead with about two ounces of silver for each unit of lead, and smelter returns on the first three carloads of lead-silver concentrates averaged almost $13,000 per car.

● **Development work on the new 950-ft level at Day Mines' Dayrock Mine** north of Wallace in the Coeur d'Alene

(*Continued on page 170*)

Moderate cost . . . light on labor little maintenance . . . BUT



Crescent Scraper of 5-cu. yd. capacity—rigged for gravity return—shown returning to excavation point in the pit. Ask for Catalog A and Field Report 214.

SAUERMAN EQUIPMENT

Slackline cableway performs difficult excavation of non-caving material from wet pit. 70% rock and 30% colloidal sand posed tough digging job. Ask for Catalog C and Field Report 216.

Check on digging power . . . rate of haul . . . clean dumping. Add labor economy . . . low upkeep . . . personnel safety . . . moderate power consumption. Total up the score . . . you'll choose one of these Sauerman Machines for your operation.

DRAG SCRAPER: *best* for pit or hill excavation, reclamation or general handling of materials, wet or dry. Serves as rapid, long range conveyor. Sizes ⅓ to 15 cu. yds.

SLACKLINE CABLEWAY: *best* for deep digging — especially underwater — and conveying to a high delivery point. Reaches down a hundred feet or more . . . spans up to 1000 ft. . . . sizes ⅓ to 3½ cu. yds.

DRAG SCRAPER STOCKPILER: *best* for profitable handling of sand and gravel, ores and chemicals. Low on first cost, plus economical one-man operation.

CRESCENT SCRAPER ON BOOM MACHINE: *best* for increasing the work capacity of any boom machine on backfilling and grading jobs. When scraper is used with track cable and trolley, machine range is greatly extended.

Two small scrapers reclaim different sizes of crushed stone from adjoining piles to belt conveyors delivering to a common hopper used to load cars with straight or mixed sizes. Ask for Catalog E.

Call on Sauerman's *experienced* engineers for the size and type system *best* suited to your digging, hauling or materials handling requirements. Write for catalogs . . . ask for idea-packed Sauerman News.

Crescent on boom machine dumps large load of wet peat. Bucket is gravity-returned on track cable to digging point. Ask for Catalog J-1 and Field Report 219.

ONE MAN MATERIALS HANDLING

SAUERMAN BROS., INC.

584 S. Clinton St., Chicago 7, Ill.

Speeding up with products of United

This is a U. S. Giant® Style XN Conveyor Belt—one of the tireless workhorses you'll find throughout the Mesabi Range. The excellent troughability is created by using Nylon in the transverse direction of the belt. This "U. S." Belt always trains easily, runs true, eliminates spillage.

LIKE all new developments, Taconite brings new problems for the mining companies—new problems for the manufacturers who must supply them with the right tools for the job.

United States Rubber Company has always been a pioneer in supplying materials for iron mining. The new Taconite processors can rely confidently on the fact that "U. S." will fulfill its requirements just as completely and faithfully.

Shown here are a few of the many products "U. S." makes for the iron mining industry. Each item is a *quality* product—the result of careful thinking and intensive work by "U. S." engineers who are specialists in the mining field. One example of "U. S." pioneering is the new U. S. Tailing Hose specially designed to handle iron ore tailings. In every instance, the goal of each of these products is to cut operating costs and thereby enable the operator to attain a good competitive position.

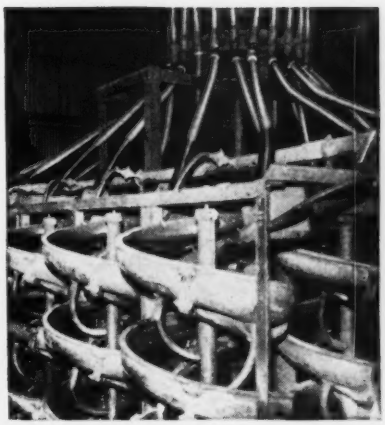
Leading mine officials can cut costs right from the start by buying from one source—and save time and trouble in the bargain. For fast, dependable delivery of United States Rubber Company products for the iron mining industry, order from your distributor or get in touch with one of the 25 "U. S." District Sales Offices.

Have you investigated the "U. S." three-way Engineering Plan? In three-way engineering, "U. S." engineers work hand in hand with the designers of the conveyor system and the engineers of the mine. This is a positive, fool-proof way of obtaining the *right* belt construction for the particular job.

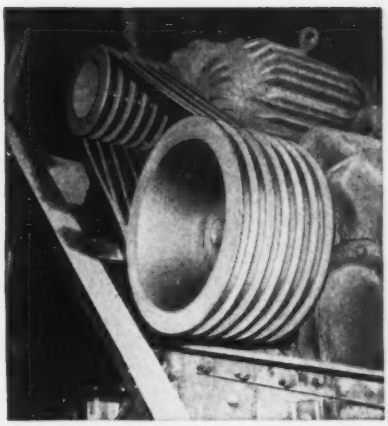
Iron Ore Mining

States Rubber Company

Ustex-Nylon belt by U. S. Rubber, installed on the Mesabi Range. 2,200 feet of this belt replaced 2½ miles of railroad track.



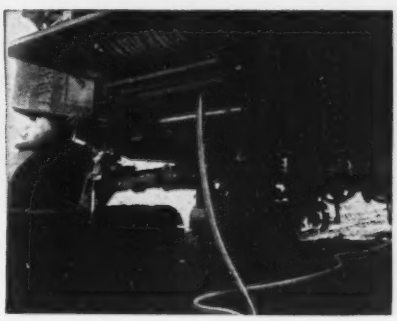
"U. S." small diameter hose and tubing play an indispensable part in iron ore separation. Above photo shows a section of a Humphrey Spiral equipped with "U. S." hose and tubing.



Matched set of six U. S. Rainbow® V-Belts which transmit power to a vibrating screen separator. These belts must withstand great shock loads from the vibrating action and must resist the action of abrasive particles which would damage ordinary belts.

U. S. Tailing Hose is designed as a flexible connection between the hopper and the metal pipe that conveys tailings to the processing plant. This hose withstands the abrasive action of the tailings, the high working pressures and the extremes of weather encountered all year 'round on the Mesabi Range.

U. S. Pilot® Flexible Pipe can run in a direct line from coupling to coupling—no need for elbows or short connections. Readily compensates for misalignment of pipe line and pump connection. Can be installed by unskilled crew in one-quarter the time for metal pipe, lasts far longer, weighs less. Will carry corrosive chemicals and solids such as Taconite, iron, coal and sand when suspended in water.



U. S. Royal® Shovel Cables are insulated with a high-grade rubber compound, and the conductor assembly is protected by a 60% neoprene sheath, vulcanized in lead for maximum density and ruggedness. Seven grueling laboratory tests, each of them tougher than actual conditions, guarantee U. S. Royal's resistance to moisture, abrasion, cutting, heat, cold, impact, flexing.

U.S. RUBBER
SERVING THROUGH SCIENCE

"U.S." Research perfects it *"U.S." Production builds it* *U.S. Industry depends on it*

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Hose • Belting • Expansion Joints • Rubber-to-metal Products • Oil Field Specialties • Plastic Pipe and Fittings • Grinding Wheels • Packings • Tapes
Molded and Extruded Rubber and Plastic Products • Protective Linings and Coatings • Conductive Rubber • Adhesives • Roll Coverings • Mats and Matting

NO AX TO GRIND HERE!

We Manufacture All Types of
FILTER CLOTH

NYLON
COTTON
GLASS
ORLON** acrylic fiber
DYNEL
VINCEL***
SARAN
VINYON N*
RUBBER COVERED SCREENS

*T.M.—Union Carbide & Chemical Co.
**T.M.—E. I. du Pont de Nemours Co.
***T.M.—Reg. U.S. Pat. Off.

As manufacturers of an extensive line of Filter Cloths our analysis of and recommendations for your filter cloth problems will be unbiased...we have "no ax to grind" regarding any particular cloth.

Each of the cloths listed above offers different operating advantages. Each type has its own range of chemical resistance, its own temperature limits and its own degree of resistance to moisture, molds, fungi and bacteria. With such a variety we are in position to recommend a filter cloth that will give you the best service for your particular application.

In writing for literature and test samples please tell us about your problem.

Weavers of Industrial Filter Media for over Forty Years

NFM The National Filter Media Corp.

General Offices & Mills: New Haven 14, Conn.
Western Office & Factory: Salt Lake City 1, Utah

Sales Offices—Representatives

Chicago, Ill.	Cincinnati, Ohio	Houston, Texas	Oslo, Norway	Johannesburg, South Africa
2627 West 19th St.	Roselawn Center Bldg.	1406 Second National Bank Bldg.	Nicolai Friis	Edward L. Bateman

Idaho *(Continued)*

district is disclosing ore comparable to that on the 800-ft level, company officials report. Less than half of the expected ore length on the lower horizon has been opened so far.

● **Claud D. Fox of Bonners Ferry, former secretary of Kootenai Dike Mines Inc.,** has reported finding high-grade copper ore in two old tunnels on the Clancey property near Bonners Ferry. One tunnel shows a four-foot width of good ore along the footwall of a big vein, and the other tunnel, about 100 ft farther down the hill, contains a greater width of the same ore, he stated. Assay reports are said to indicate a copper content of 14½%, with other mineral values.

● **Day Mines Inc. has earned the commendation** of the U.S. Forest Service for the progress it has made on a timber management and tree-farming program started about two years ago. Some of the tree-farm acreage is at the company's Aurum gold property in Ferry County, Wash., some in the Metaline District of Pend Oreille County, Wash., some at its Jupiter Mining Co. holdings in Western Mineral County, Mont., and some in the Nine Mile Canyon and St. Joe River drainage of Shoshone County, Idaho.

● **Whitedelf Mining & Development Co. has opened and is now developing** what is believed to be the downward extension of main Pearl vein ore shoot on the new 800-ft level at its property near Clark Fork. The point where the vein was encountered showed a 15-ft width of commercial silver-lead ore, according to Compton I. White, Sr., secretary-treasurer of the company. Development tonnage from along the footwall of the structure is being put through the Whitedelf mill and several small shipments have been made. Two truckloads totaling 14,050 tons, containing 515 oz of silver and 78.8% lead, netted the company $2,672. A third truckload averaged 63.8% lead and 78.8 oz of silver.

● **Princeton Mining Co. stockholders have approved Hecla Mining Co.'s proposal** to explore and develop the 36-claim Princeton property in the Pottsville area east of Mullan in the Coeur d'Alene District for a 60% interest in the claims.

● **Deep development of the Vindicator Silver-Lead Mining Co.** property east of Mullan in the Coeur d'Arlene District, under a $229,500 DMEA contract, was scheduled to begin early in 1954. Preparatory work-cutting in the power supply, procuring of necessary supplies and equipment, laying of new track in the adit tunnel,—is well advanced and enlarging of approximately 100 ft of the adit to the proposed site of the shaft station is in progress.

The DMEA contract was concluded by Silver Buckle Mining Co. which has an agreement with Vindicator to develop the property on a 50-50 profit-

ANNOUNCING...

A NEW TIME-SAVING, MONEY-SAVING PLAN... FOR EQUIPMENT OWNERS...

THE BRODERICK & BASCOM *Yellow Strand* SPEEDI-SERVICE PLAN

Now you can insure immediate delivery of the *right* wire rope at the right time! You can increase equipment earning time, decrease down time!

Now you can save time and money with the Yellow Strand Speedi-Service Plan!

There's no extra cost, no obligation. All you do is have your nearby Broderick & Bascom distributor register your equipment. Then, when you need rope, just call, giving machine make and model and the particular rope needed. The exact size, length and type will be obtained from your record file and the order filled from stocks controlled by these records. Delivery is made according to your recorded instructions.

Start saving time and money with the Yellow Strand Speedi-Service Plan. Call your Broderick & Bascom distributor or mail the coupon.

HOW THE SPEEDI-SERVICE PLAN SERVES YOU...

1. File cards, describing each of your machines and its wire rope requirements are filled in by your Broderick & Bascom distributor.

2. The cards are placed in an active file, where your distributor can go to tell in an instant what type and size of rope you will need for any machine.

3. When a line requires replacement, call your Broderick & Bascom distributor. Tell him which machine needs the rope. He will refer to his records and fill your order immediately from his ample stock of long-lived Yellow Strand.

SPECIFY...

Yellow Strand

FOR SAVINGS... SAFETY... SPEEDI-SERVICE

...a product of Broderick & Bascom Rope Co. St. Louis, Mo.

TO START YOUR SPEEDI-SERVICE PLAN... MAIL COUPON

Broderick & Bascom Rope Co.
4203 Union Blvd. • St. Louis 15, Mo.

Gentlemen:

I'm interested in saving time and money with the Speedi-Service Plan.

- ☐ Send me the folder describing the Speedi-Service Plan.
- ☐ Send me the Speedi-Service Plan Equipment Registration Form.
- ☐ Send me the name of my Broderick & Bascom distributor.

Signed.....

Company.....

Address.....

City..... State.....

To producers of sand and gravel, rare earths, and other mineral products

Combine digging and

made-to-order processing plant

aboard a YUBA dredge

This Yuba dredge (4000-ton displacement) digs 112 ft. below water with 18 cu. ft. buckets; has ample deck space for processing machinery.

Dredging costs under 5¢ per ton for gravel are not uncommon with large YUBA bucket ladder dredges. They also have dug cemented gravel, boulders, and into bedrock without costly drilling and blasting. They float in their own ponds, excavate without lowering surrounding water levels. Bucket sizes range from 2½ to 18 cu. ft. . . . digging depths from 10 ft. or less to 125 ft. below water.

Complete Plant Afloat

Your YUBA dredge can be built to screen out rocks; to break up and wash away surplus clay; to size through single or multiple screens; to remove mineral products by jigs, cones or magnetic separators. In short, you can completely process and grade your product as you dig, all aboard a YUBA dredge.

Choice of Handling Methods

Your dredge can be designed to stockpile ashore, load into trucks or shore conveyor; load into barges; or pump ashore through pipes.

Consult YUBA NOW. We can build you a new dredge... redesign, move and rebuild a used dredge . . . to fit your particular needs. Wire, write or call us — no obligation of course.

67

YUBA DREDGES — PROVED DEPENDABILITY THE WORLD OVER

YUBA MANUFACTURING CO.

Room 706, 351 California St., San Francisco 4, California, U. S. A.

AGENTS { SIME, DARBY & CO., LTD. · SINGAPORE, KUALA LUMPUR, PENANG.
SHAW DARBY & CO., LTD., 14 & 19 LEADENHALL ST., LONDON, E. C. 3.

CABLES: YUBAMAN, SAN FRANCISCO · SHAWDARBCO, LONDON

Idaho *(Continued)*

sharing basis. New Park Mining Co. of Salt Lake City is assisting in the financing and is in charge of the development project.

● **Goldstone Mining Co. has suspended operations at its mine** near Salmon, Idaho, because of winter conditions. When work was stopped the face of the new lower adit was in 1950 ft and just a few rounds away from the main Goldstone vein objective. Patches of ore had been found in the last rounds blasted, officials said.

● **American Smelting & Refining Co. is producing about 140 tons of ore daily** from development work at the Vulcan Silver-Lead Corp. property on Lake Gulch west of Wallace. Several development headings on the 2800 and 3,000 levels are in progress and preparations for opening a new 2400 level are being pushed steadily.

The new silver-copper orebody, opened on the 3,000 level early in 1953, has now been drifted out on the 2800 horizon and has proved to be somewhat shorter than on the lower level but about the same in grade. On the 3,000 level the ore shoot was more than 500 ft long.

● **Sullivan Mining Co."holed through" the new 8500-ft surface level adit** connecting the Star mill with the 2,000 level of the Star mine workings late in December. Installation of a new mine ventilation system, an underground crushing plant and a 13,300v power line is now underway.

Heretofore, the Star property, Idaho's largest zinc producer, has been mined through a 9,000-ft tunnel from the 2,000-ft level of the old Hecla shaft. The mine was literally developed from the bottom up, and its workings now extend about 3,000 ft upward from the level of original opening and some 2300 ft downward from that point.

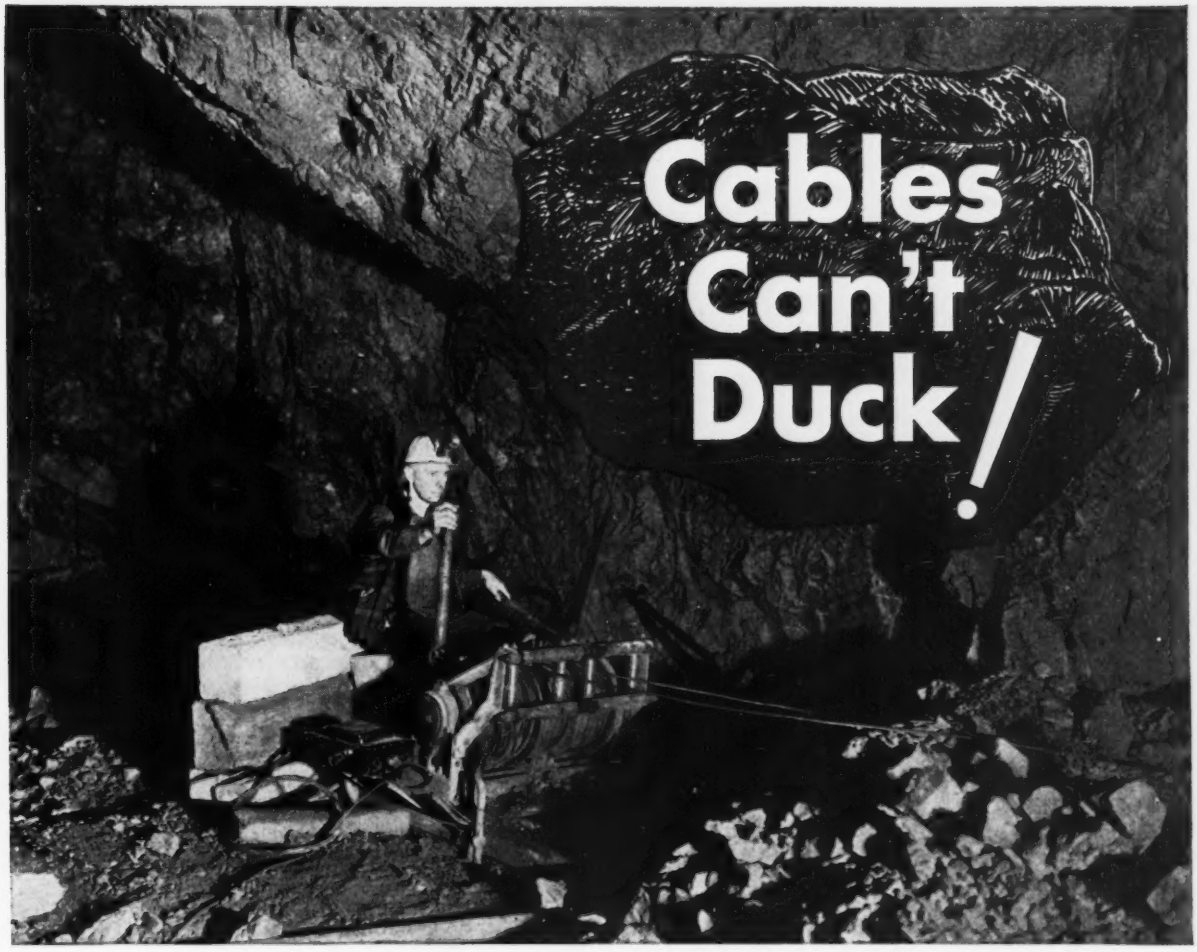
The new surface adit is expected to facilitate ore handling greatly and improve ventilation.

MICHIGAN

● **White Pine Copper Co.** plans to begin production by Nov. 1, 1954. It hopes to pay off its $57-million federal loan by 1961. The pancake-like body of ore is thought to be sufficient for 50 years of mining. Exploration work has proved up 300-million tons of low grade copper ore. Mining will be by the room and pillar method.

The mine is dry and the back is hard and strong. 150,000 tons of ore have been hoisted and stock-piled. New equipment being tested includes three self-propelled, 18-ton capacity ore cars. Total water consumption will be about 15,000 gpm. Loss in tailings is expected to be held to .1%

● **Safety prizes were awarded** to 55 men of the Zimmerman mine at Gaastra and 62 Lawrence mine employees, Crystal Falls, by Pickands, Mather &



Portable cables for slusher hoists can't duck flying pieces of ore, spalling rock, water and mechanical abuse. They have got to stay put and take it. For these reasons you need more than a good power cable; you need the best that money can buy. Cables that can stand up under these tough operating conditions are the only kind that can help turn in a profit. The profit-making, loss-preventing kind is TIREX.

Simplex-TIREX power cables have a *tough, cured-in-lead, selenium-neoprene armor* to assure extra-long life. This special armor gives balanced resistance to abrasion, water, grease, oil and flame. It is this special balance of properties that makes TIREX Cables last longer and thus enables you to scrape more tons of ore.

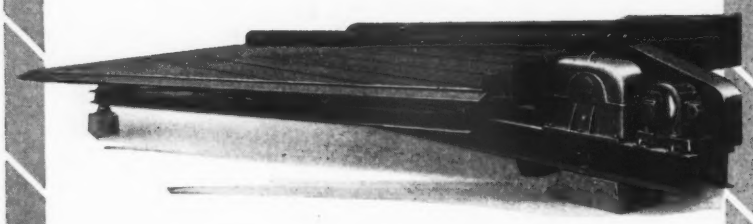
Remember to specify and get Simplex-TIREX Cables for all your portable operations, including slusher hoists. These cables are marked "Simplex-TIREX" for your protection.

Simplex WIRES & CABLES

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.

Profit with Efficient

SuperDuty Concentrating Action



Right before your eyes, the SuperDuty Diagonal Deck Table makes higher grade concentrates while surpassing any other table on the market in recovery, and while handling more tons of new feed per day. You see exactly what you are doing.

This efficiency is made possible by balancing the diagonal deck with the smooth-running head motion and a rugged, factory-aligned under-construction.

Deck covers and riffling are tailored to the specific concentration for which the table is intended.

Operating and maintenance costs are exceptionally low. Operators in many fields find that SuperDutys, singly or in batteries, are unmatched in their ability to improve their operations and margin of profit.

Send for Bulletin 118-B.

CONCENCO TYPE "CPC" CLASSIFIER

This All-Steel Constriction Plate Classifier is available in 1 to 10 or more cells. Each cell has a pressure chamber at the bottom, a sorting column just above, and a launder section at top. Advantages offered are: (1) Sharp separation, (2) accurate classification, (3) as many spigot products as there are cells, (4) continuous discharge, (5) no moving parts, (6) low maintenance cost.

THE DEISTER ★ CONCENTRATOR COMPANY

903 Glasgow Ave. • Fort Wayne, Ind., U.S.A.

CONCENCO PRODUCTS

★ *The ORIGINAL Deister Company* ★ *Inc. 1906*

Michigan *(Continued)*

Co. in recognition of having completed a full year with no lost-time accidents. Employees of the James mine at Mineral Hills and the Buck group at Iron River also received awards. Inland Steel Co. made safety awards to men of its Sherwood and Cayia mines.

MINNESOTA

• **Oliver Iron Mining Division** of U.S. Steel has just concluded the biggest mining season of its 61-year history.

R. T. Elstad, Oliver president, said that the company mined more ore, moved more material, produced more concentrates from low grade ores and shipped more ore in 1953 than in any previous season.

Some 8,100 employees in Minnesota and Michigan mines produced about 44-million tons. Four concentrating plants produced nearly 5½-million tons of concentrates from low grade ores. Material moved during 1953 amounted to 132-million tons. And averaging 12,000-tons a trip, 90 ore carriers made more than 3,600 trips.

• **Other 1953 production and shipment tonnages include:** Steep Rock Iron Mines Ltd., 1,301,688; Snyder Mining Co., 764,794; Zontelli Brothers, 626,869; Oglebay, Norton & Co., 2,130,525; Jones & Laughlin Minnesota Ore Division, 2,884,842; Skubic Brothers Co., 126,202 (concentrates); Jessie H. Mining Co., 167,256.

• **Republic Steel Corp.** has signed an exploration option with Pan American Commodities of Lima, Peru, for about 65,000 acres of potential iron ore land in the foothills of the Andes. Lands are 2,000 ft above sea level and are located a few miles southeast of San Juan in Peru.

NEVADA

• **Newton Crumley,** Elko business man, and Irvin Walters of Battle Mountain have taken over the old Cahill mining property in Paradise Valley and preparations are under way for reopening the mine and mill. The property is a cinnabar producer, and has been in operation on and off for many years. Walters, who has been at Copper Canyon, will supervise the work. A few men have been employed, and the payroll will be increased steadily as the property is developed.

• **Cementation Co. of London has been employed to determine whether grouting is feasible** for the Eureka Corp.'s deep mine properties in the Eureka vicinity. A pumping test made to determine factors involved in unwatering the mine was recently completed, and it was decided that due to the cost the project should be deferred.

In the meantime development is going forward at the Eureka Corp.'s

property a mile north of its Fad shaft, where drilling operations have revealed a good ore body at the depth of about 900 ft. The tests there have indicated a thickness of 12 to 15 ft, and the ore appears to be of much better grade than found in the Fad shaft area.

● **Cordero Mining Co. in northern Humboldt County is continuing operation of its cinnabar mine and 100-ton furnace throughout the winter months.** The property is one of the important quicksilver mines in the U.S. and accounts for about 25% of the domestic production. S. H. Williston, vice president and manager of the company, says operations will continue, but adds, "I doubt if the industry as a whole is making any money, and exploration for new reserves is at a very low level. Industry costs are continually rising and the price received for the metal is 20% below its Korean peak and down 10% for the year."

● **London Extension Mining Co. is continuing operation of the only lode gold mine now producing in Nevada.** The ore is dug by open pit method and treated in the company's cyanide plant situated south of Beowawe.

● **Nevada Scheelite Inc. is milling 90 tons of ore and 60 tons of tailings per day** at its property in Mineral County. The mine has been developed to a depth of 400 ft and the ore is of relatively high grade.

Reserves are said to be ample for several years of operation, and when the tailings supply is exhausted the company plans to operate on crude ore on the basis of 125 tons daily.

● **Gabbs Exploration Co. is mining 90 tons of tungsten ore daily** and milling it at a concentration mill at Gabbs. A shaft has been completed from the 120-ft level to the 300-ft level, and mining has been started from that point.

A flotation unit has been installed for flotation of minus 80 mesh material from the ore and 55,000 tons of impounded tailings. The operation has been highly successful during the last year, and ore reserves are said to be ample.

● **Combined Metals Reduction Co. is shipping manganese ore from the Pioche area to the stockpiling depot at Wenden, Ariz.,** and is helping to step up receipts at the Emergency Procurement Service management station there. Carload shipments are being made from the Caselton mine, and are bringing a return reported to be about $30 per ton.

MONTANA

● **Amador Mining Co. has deepened the inclined shaft** at the Green Mountain Mine near Dixon to the 250 level and has commenced lateral exploration to open at an additional 100 ft of depth the high-grade copper ore shoots which have been worked in upper lev-

"Engine Savers"

TWIN DISC MODEL CF TORQUE CONVERTER

"These Twin Disc Truck-Type Torque Converters are engine savers," says Bill Cross, garage foreman whose job it is to keep 30 Dart rear-dump 30-yard trucks moving millions of tons of overburden now . . . and copper ore later, at the huge open pit mine of the Anaconda Copper Mining Company at Weed Heights, Nevada.

• • •

"When what they save in labor and parts on engines and driving units and brakes on one truck is multiplied by 30, like it is here, you've got a friend you don't want to part with," adds Cross.

Twin Disc Truck-Type Torque Converters save not only engines, but brakes, axles, transmissions, clutches — they keep engines operating in their most efficient range; start heavy loads smoothly; provide firmer traction; reduce shifting and pedal braking; prevent fatigue . . . promote operator efficiency.

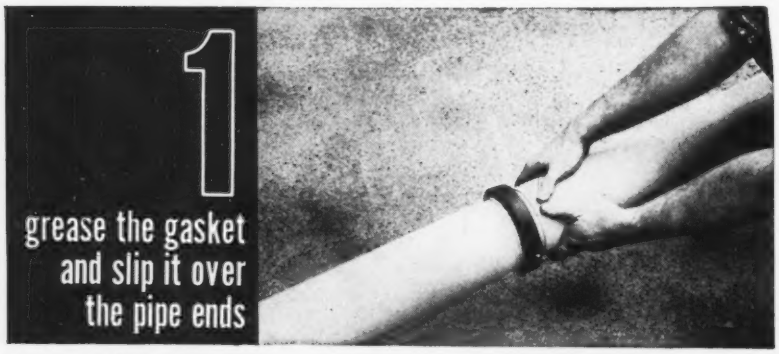
Twin Disc Truck-Type Torque Converters are available for all heavy duty diesel truck engines, in two distinct types—Model CF for short, steep up-and-down runs, and Model DF with lock-out feature providing direct mechanical drive for long hauls with intermittent grades.

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

TWIN DISC

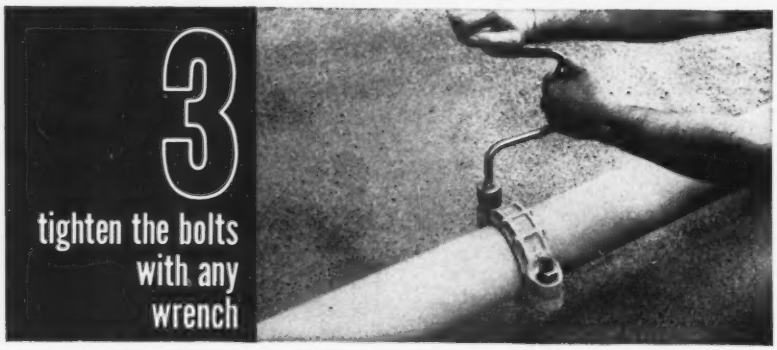
TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • SEATTLE • TULSA



It's as easy as 1-2-3

to couple grooved pipe with



GRUVAGRIPS

Three simple steps; that's all there is to it! And rugged, re-usable GRUVAGRIPS are just as easy to remove. They're made in ¾" to 14" sizes. Next time you're at the supply store, ask the man to show you GRUVAGRIPS and GRUVAGRIP FITTINGS. (For plain end pipe, ask for ROLAGRIPS couplings.)

Write today for your free copy of the new eight page, two color G-B pipe coupling products folder. It illustrates and fully describes methods that save you time and money. Ask for folder BCF7-53.

GUSTIN-BACON MANUFACTURING CO.

210 WEST 10TH STREET KANSAS CITY 6, MISSOURI

Montana *(Continued)*

els. An additional 200 ft of shaft sinking is planned in the spring. The Amador firm is operating the property under an agreement with Kootenay Copper Mines and has been granted a DMEA loan.

● **Cyprus Mines, Inc.,** Los Angeles, has discontinued exploration of a zone of radioactivity on the Water Hole property in Mineral County, 20 mi east of Saltese. About 300 ft of tunneling, under a contract with the Atomic Energy Commission, failed to yield encouraging results, officials reported.

NEW MEXICO

● **First commercial production of hydrochloric acid in New Mexico** has been started in a new plant near Carlsbad, built by International Minerals & Chemical Corp.

The hydrochloric acid comes from what has been previously a waste product. In the process of producing potassium sulphate, magnesium chloride has been discarded as waste. In IM&CC's new plant this waste is being used to produce the hydrochloric acid and magnesium oxide.

Most of the acid will be used by the oil industry in southeastern New Mexico and west Texas. IM&CC is one of the major companies now mining the huge potash deposits near Carlsbad.

NORTH CAROLINA

● **Commercial mining of thorium ore** was scheduled to begin last month in mountainous Ashe County, near the Virginia border.

The H. & H. Construction Co., of Clarksburg, W. Va., has leased 3400 acres of Ashe County farmland. Nicholas A. Raschella, H. & H. field repsentative, said the AEC had classified the ore as gadolinite. It was added that the AEC would be the only buyer of the ore.

OREGON

● **Work at the Illinois River water level in the Midnight chromite claim** of M. J. and Phil McShane, Grants Pass, has been discontinued and the two have moved to higher ground for winter months in the nearby Black Beauty claim.

An incline is being sunk to intersect the lowest of two caved tunnels where a narrow stringer of high grade chromite is reported exposed. New incline has by-passed the face of the upper tunnel and found the ore and serpentine badly crushed due to landsliding.

The stringer of this Josephine County claim may be an extension of chromite being mined on the adjoining Lucky Star claim being worked by Everett McTimmonds.

an ACCO product

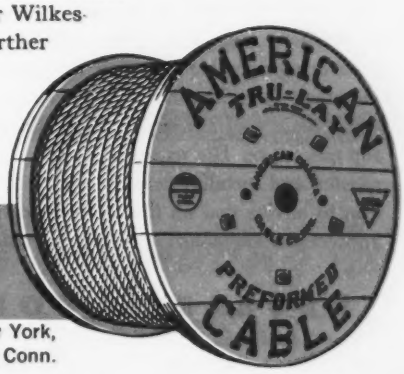
TRU-LAY Preformed WIRE ROPE

Why TRU-LAY "Green Strand" Stands Clamshell Punishment...

● TRU-LAY GREEN STRAND is made of improved plow steel to withstand the jerking, whipping, and twisting that punish clamshell ropes. The outside wires are large enough to take the abrasion caused by dirt particles imbedded in the rope. Preforming makes the wires last longer bending around the small sheaves.

The records for longer service established by TRU-LAY Preformed GREEN STRAND on all kinds of earthmoving equipment result from the use of the one best construction and grade of wire rope for each particular job. AMERICAN CABLE engineers check constantly to keep TRU-LAY rope constructions abreast of changing machine designs. That's why you can rely on TRU-LAY recommendations.

Insist on and get TRU-LAY Preformed GREEN STRAND improved plow steel wire rope for every machine you operate. You can identify it by the green strand. Call your AMERICAN CABLE distributor today or write our Wilkes-Barre office for further information.



ACCO

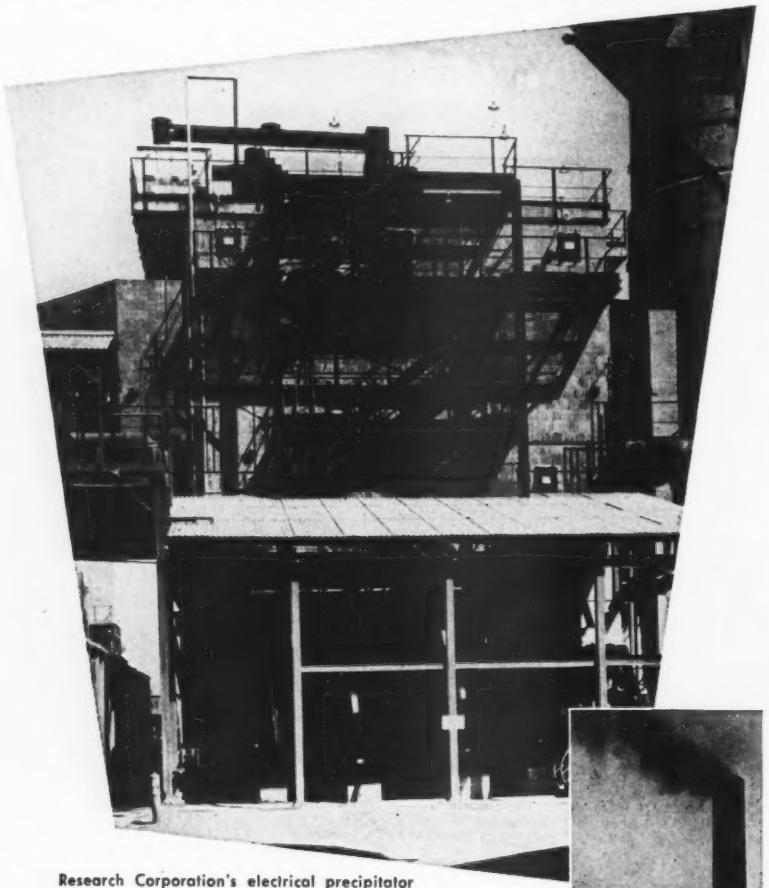
TRADE MARK

AMERICAN CABLE DIVISION
AMERICAN CHAIN & CABLE

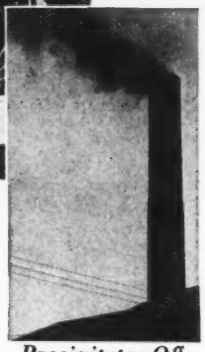
Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

New Jersey Zinc

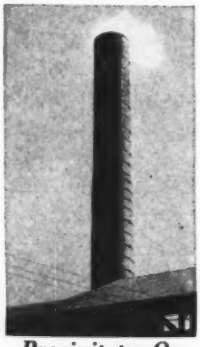
Recovers Values from Fume



Research Corporation's electrical precipitator installation at the Palmerton, Pa. plant.



Precipitator Off



Precipitator On

The two photographs (right) show the results of this Research Corporation installation. The smoke in the picture at the top (Precipitator Off) consists of dry dust and fume entrained in the zinc ore sintering machine gases.

The picture at the bottom (Precipitator On) shows nothing but water vapor escaping from the same stack.

If you have a fume problem that involves recovering valuable materials that are going up the stack or combating a smoke nuisance, get in touch with your nearest Research Corporation representative. His experience with over 300 roaster and metallurgical precipitators will enable him to advise you on the most effective—and economical solution to your problem.

RESEARCH CORPORATION

405 Lexington Avenue, New York 17, N. Y. • Bound Brook, N. J.
Grant Building, Pittsburgh 19, Pa. • 122 South Michigan Avenue, Chicago 3, Ill.

Oregon *(Continued)*

● **U. S. Bureau of Mines began diamond drilling at the Queen of Bronze Copper mine,** just east of Takilma, in December under supervision of Richard N. Appling. The exploration is the result of soil sampling and other work of a few years ago by the Bureau. The Bureau crew has not indicated how many drill holes are planned.

● **Perlite ore processing equipment of Dant & Russell Inc. at Maupin in Wasco County** has been sold to L. E. Herron, Portland, and is to be dismantled. Buildings and property were under lease by the owners, who built the plant at a cost of nearly $2-million to produce lightweight building aggregate and acoustical tile. Dant & Russell suspended operations two years ago and leased to Kaiser Gypsum, which in mid-1952 dropped its option to buy.

WASHINGTON

● **Kromona Mines Corp.** is operating its new 100-ton flotation mill 12 hr daily in the Sultan Mining District in Snohomish County. Underground work reportedly is on a two-shift basis. It is expected that the mill will be operating around the clock soon.

Some 25 men are employed. Joseph F. Krom, Seattle, president-general manager, reported that 98% of the copper, silver and gold is being recovered and about 80% of the tungsten. Copper concentrates were trucked to the Tacoma smelter.

● **Northwest Refining & Chemical Co.** have filed articles for incorporation for a firm to develop a new ore refining process. It is hoped that the process will reduce cost and time involved in present zinc oxide refining methods.

● **Howe Sound Co. plans copper and cobalt exploration projects** in Washington and Idaho partially underwritten by DMEA.

DMEA will loan $219,410, half the cost, for a copper exploration project in Buckskin Mountain, near Holden, in Chelan County, Wash. Howe Sound will tunnel into the mountain from its Holden Mine, Washington State's largest copper producer.

Company officials acknowledged that in the 4000-ft bore there is a possibility of finding nickel as well as copper.

Through a Howe Sound subsidiary, Calera Mining Co., an exploration contract has been signed with DMEA for a $407,340 loan to hunt new cobalt-copper ore bodies near the firm's Blackbird Mine in rugged Lemhi county, Idaho.

For this project the DMEA will advance 70% of the cost, $285,138, according to the Spokane field office. Both surface and underground work is anticipated.

The contracts run for two years and the loans are repayable from ores produced.

"This Boy Scout stuff pays off!"

"I use the *square* knot to tie two pieces of Plain Primacord together when I want to lengthen the trunk line aboveground. It can be drawn up tight and won't slip back. But I never use *any* knot in a hole. It might hang-up the explosives when loading, and you don't want that to happen.

"A 500-ft. reel of *Plain* Primacord weighs only 9 pounds – it's easy to lay it out fast. You can use it in small or shallow holes, too.

"But when we go down deeper I want *Reinforced* Primacord. It has a tough cover, and greater tensile strength.

"When I'm handling those heavily reinforced explosives containers, or when I'm working in deep, ragged holes, I go for *Wire Countered* Primacord.

"And for river crossings—or where a field shot must stand a long time before blasting – I use *Plastic Reinforced* Primacord.

"If you want good results every time, use the *right* Primacord – and use it *right!*"

P-12

See your explosives supplier or write for information to

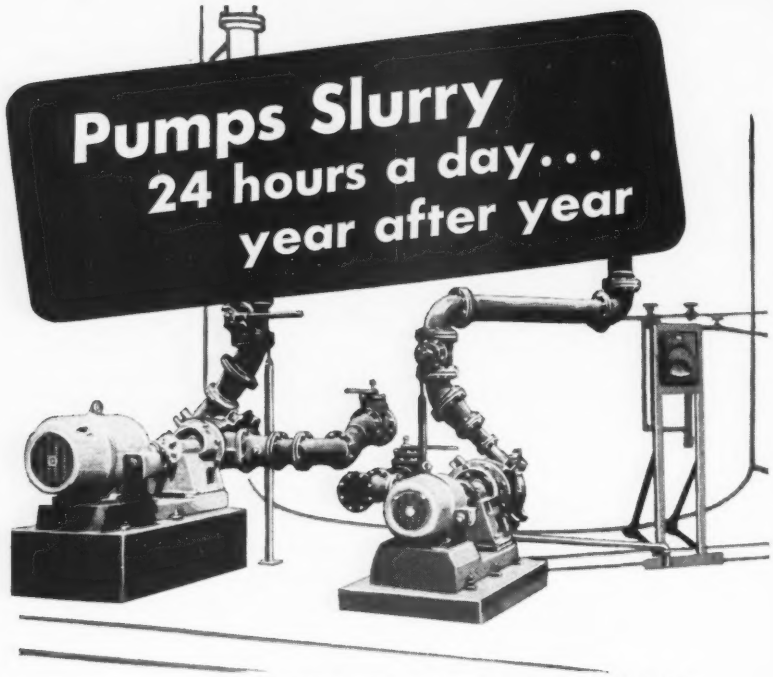
THE ENSIGN-BICKFORD COMPANY

Simsbury, Connecticut

Also Safety Fuse since 1836

PRIMACORD® *detonating fuse*

PROVED and APPROVED



● MORRIS TYPE R SLURRY PUMP at the left is on continuous 24-hr. duty delivering 1000 GPM of a 170° lime slurry at 100′ head. Fifty-HP motor operates at 1180 RPM. Intermittent-duty pump at right delivers 200 GPM at 50′ head with 7½-HP motor turning at 880 RPM.

In slurry-handling operations, "long-term service" is a meaningless claim unless the pump will work day-in and day-out with a minimum of maintenance time, trouble and expense

Morris Type R Slurry Pumps—with an established reputation for longer life—also incorporate in their design exclusive features which result in easier installation . . . fewer interruptions to service...less overhaul...fewer replacements.

To provide uninterrupted service . . .

The gland is under suction pressure only. This reduces leakage and dilution . . . keeps harsh abrasives out of the stuffing box . . . practically eliminates packing troubles.

There are no internal studs or bolts. Caustic and corrosive solutions cannot seep past threads and cause maintenance headaches.

To make installation and dismantling easy . . .

Shell is interchangeable for right or left hand rotation. Suction and discharge nozzles can be rotated around the axis of the pump to a total of 72 different locations.

Impeller removed without disturbing the piping. You simply loosen 4 *outside* clamping bolts and pull off the end cover. This feature alone saves considerable time and labor.

● Free Service. Morris Engineers will be glad to recommend the pump best suited to your needs for size, capacity, etc. Send necessary data today . . . include request for Bulletin 181.

MORRIS MACHINE WORKS
Baldwinsville, N. Y.
Sales Offices in Principal Cities

MORRIS *Centrifugal Pumps*

UTAH

● **In the two largest uranium property purchases** in Colorado Plateau history, some $3½-million changed hands recently.

Joseph W. Frazer, co-founder of the Kaiser-Frazer Corp. has obtained an option to purchase the Big Buck uranium claims in the Big Indian mining district, San Juan County, Utah.

Announcement was made at Moab (Jan. 7) by Charles Steen, whose major uranium producing properties adjoin the Big Buck claims.

Frazer and his associates have formed the Standard Uranium Corp. to develop the Big Buck property. They have agreed to spend $200,000 during the next six months in exploration and development work, according to Steen.

If ore is found in quantity, they have agreed to pay $2-million for the properties, which are owned by Utah State Senator Donald A. Adams and Dan Hayes of Monticello. Frazer and his associates got the option from Steen and William McCormack, of Dove Creek, Colo., who in turn had paid Adams and Hayes $50,000 for the option.

Standard Uranium reimburses Steen and McCormack for the option and has assigned them a stock interest in the company, Steen declared.

Steen has been made a director in the new corporation, along with McCormack and K. Ralph Bowman of Salt Lake City.

The property includes 11 claims with an estimated 100,000 tons of staked out reserves. Some 5,000 tons of uranium ore have already been mined at one claim, according to Steen.

In the other transaction, a Denver corporation bought claims in three areas of southeastern Utah and southwestern Colorado for upwards of $1.5-million. Purchaser was the Four Corners Uranium Corp. of which E. H. Sanders is president.

Claims included 42 claims in the Green River group in Utah's San Rafael area; 23 claims in the Gramlich group in the La Sal Creek sector of Utah, and 196 claims in Montrose and San Miguel Counties in Colorado.

The Gramlich group claims were located by Walter Gramlich, who received the first AEC bonus of $9,652 ever paid for uranium discoveries. Sanders reported production in the Utah and Colorado properties totals 50 tons daily and will be doubled by March 1.

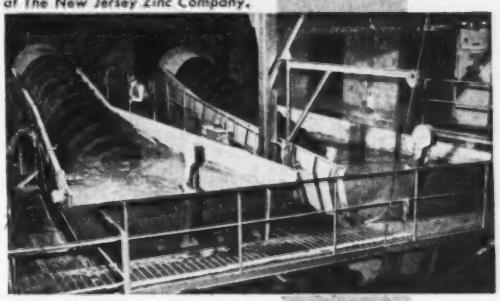
Some 95% of the Colorado claims are undeveloped, but 100,000 ft of drilling is slated for 1954, he said.

Sellers included Colorado State Senators Lew Williams, Norwood, and Stephen L. R. McNichols, Denver; Tom Skidmore, Dove Creek; George Cory and Fred Paddock, Montrose; Roy Stone, Olathe, and Robert Williams, Norwood. In addition to cash, sellers received some stock in

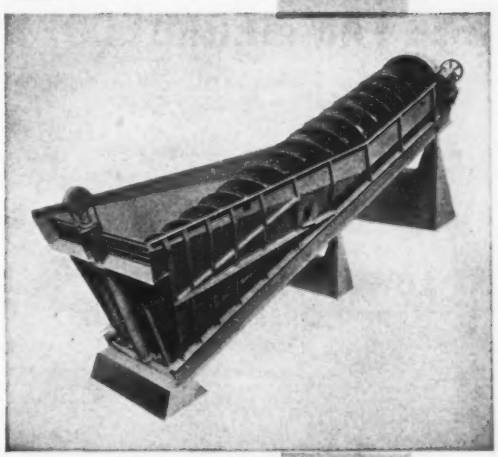
THE NEW JERSEY ZINC COMPANY
obtains efficient performance from WEMCO S-H CLASSIFIERS

At the Austinville, Virginia, plant of The New Jersey Zinc Company, Wemco S-H Classifiers are being profitably used for wet classification control of the grind. Used in the primary grinding circuit, these Wemco units have proven efficient and economical in this producer's closed circuit grinding operations.

78" Wemco S-H Classifier operating in closed circuit with grinding mill at The New Jersey Zinc Company.



Typical installation of Wemco S-H Classifiers in a closed grinding circuit.



84" diameter Wemco S-H Classifier.

ONLY THE MODERN DESIGN OF WEMCO CLASSIFIERS OFFERS YOU ALL THESE FEATURES

Metallurgical Advantages

Greater raking capacity — S-H (Special-Helix) design employs advanced pitch and vari-pitch helices to provide up to 100% greater sand conveying capacity.

Sharper separation — controlled agitation and larger effective pool area means less undersize in the sands, less oversize in the overflow.

Greater overflow capacity — up to 25% more effective pool area than other types of units.

Balanced operation — between overflow and raking requirements with wide choice of tanks and spirals for correct performance under any condition.

Better drainage — spiral action squeezes out maximum amount of free moisture leaving drier sand for easier conveying and closed-circuiting.

Design Features

Up to 40% greater shaft strength — large diameter tubular shaft gives maximum protection against shutdowns.

Long-life wearing shoes — of tough, thick alloy with large cross-section; cuts replacement costs to as low as 4/100 of 1 cent per ton of sand raked.

Anti-friction bearings throughout — grit-proof lower bearings; gudgeon-type upper bearing mounted on hub of main bevel drive gear.

Simple hydraulic lifting device — operated by either hand or pump; affords protection against clogging or jamming; permits lifting of spiral to start machine without draining tank.

Efficient gear drive — employs special worm gear speed reducer; uses standard speed motor.

Send For Free Classifier Bulletin

This new, 20-page bulletin contains valuable, up-to-date information on wet classification principles and their application to Wemco S-H Classifier design. Write today for your free copy. No obligation.

PRINCIPAL OFFICES
San Francisco • Sacramento
Salt Lake City • Spokane
Denver • Phoenix
Chicago • Hibbing, Minnesota
New York • Birmingham
Toronto, Canada
Jeffersonville, Indiana

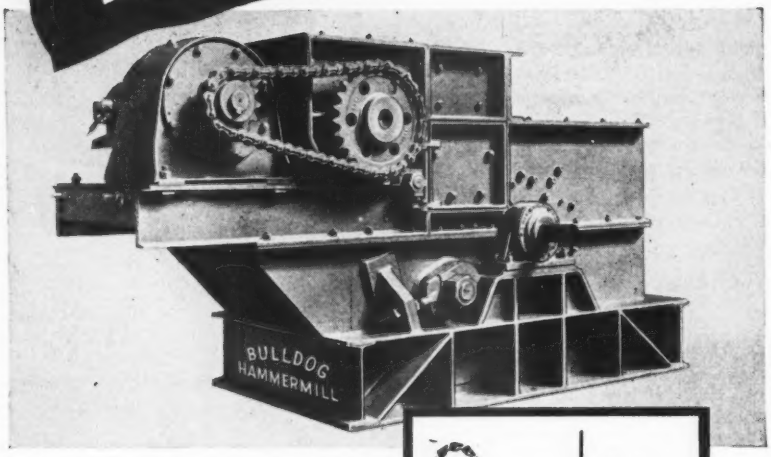
EXPORT DISTRIBUTORS
Fraser & Chalmers (S.A.) (Pty.) Limited
P. O. Box 619, Johannesburg, South Africa
Lilestone & Co., Inc.
P. O. Box 3368, Manila, Philippines
United Development Corporation Pty. Ltd.
P. O. Box 3460, Sydney, N.S.W., Australia
Corporation Commercial Sudamericana S.A.
Casilla 505, Lima, Peru
The Sumitomo Machinery Co., Ltd.
5-22 Kitahama, Higashi-Ku, Osaka, Japan

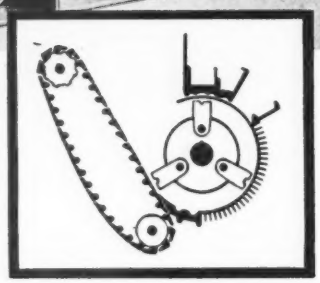
WEMCO
WESTERN MACHINERY COMPANY
760-766 FOLSOM STREET · SAN FRANCISCO 7, CALIFORNIA

Mobil-Mills • Coal Spirals • HMS Thickeners • HMS Pumps • Sand Pumps • Agitators Cone Separators • Drum Separators • Hydroseparators • Fagergren Laboratory Units Fagergren & Steffensen Flotation Machines • S-H Classifiers • Attrition Machines HMS Laboratory Units • Dewatering Spirals • Thickeners • Conditioners • Densifiers

EXCLUSIVE NEW NON-CLOG TRAVELING BREAKER PLATE

BULLDOG HAMMERMILLS





Exclusive NON-CLOG MOVING BREAKER PLATE moves wet, sticky materials rapidly through the Bulldog Hammermill without slow-downs. This gives twice the capacity of others! Bulldog *manganese steel* hammers last 15 times longer. Get full details today about how you can double production, cut costs with the Bulldog Hammermill. Ask about other models, too!

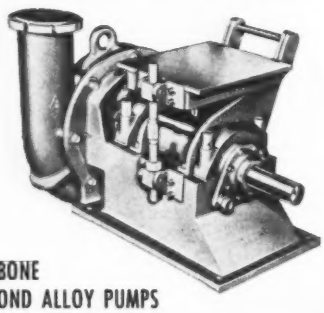
HAMMERMILLS, INC.

WRITE FOR BULLETIN 533

4700 West Division Street
Chicago 51, Ill. • SPaulding 2-9300

Subsidiary of PETTIBONE MULLIKEN CORP.

Lowest Maintenance Cost of Any Pump
FOR ORES AND SOLIDS



PETTIBONE
DIAMOND ALLOY PUMPS

No mine pump equals PETTIBONE DIAMOND ALLOY PUMPS for resistance to abrasion, for only Pettibone uses Diamond Alloy Steel. Exclusive overhead motor-mount with V belt drive conserves space, makes speed adjustments simple.

Ask for Bulletin 353.

HYDRAULIC DIVISION
4700 West Division Street
Chicago 51, Illinois SPaulding 2-9300

PETTIBONE MULLIKEN CORP.

Utah *(Continued)*

the Four Corners Uranium Corp.

● **Utah Mining Association at its December annual meeting called for:** a consistent, coordinated Federal minerals policy; "unimpaired" retention of the Taft-Hartley Act; revision of tax policies; and Tariff Commission action on lead and zinc imports.

UMA announced that total membership has been boosted to 15 firms with the added affiliations of two new companies: Utex Exploration Co., Moab, Charles A. Steen, president; the Calera Mining Co., Garfield, W. R. McCormick, manager.

● **Six new DMEA contracts have been approved in Utah.**

They are with Gerald Gidwitz, Beaver County, uranium, government contribution $29,880, contract value $33,200; Gramlich Minerals, Inc., Emery County, uranium, $31,770 and $35,300; Mid-State Development Co., Millard County, tungsten, $13,688 and $18,250; Mineral Uranium Corp., Grand County, uranium, $21,600 and $24,000; Timco Inc., Tooele County, tungsten, $1,687 and $2,250.

● **Kennecott Copper Corp. has paid $1,274,670.35 to the Utah State Tax Commission** in part payment of a disputed $5-million tax claim by the state against the corporation.

The amount paid was the portion of the claim Kennecott "conceded" is legally due as the result of the Utah State Supreme Court decision of 1950 requiring mining companies to deduct federal income and excess profits taxes to determine net income before completing depletion allowances under Utah statutes.

● **Production of metallurgical coke** and gasoline from Uintah Basin Gilsonite will be tested during January on a semi-commercial scale at a $750,000 pilot plant at Bonanza, Utah, officials of the American Gilsonite Company report.

The tests will determine whether the unique Utah hydrocarbon can be utilized as a source for electric coke for use by the aluminum industry.

● **Vanadium Corp. of America has abandoned plans** to build a $3-million uranium mill at Hite, Garfield County.

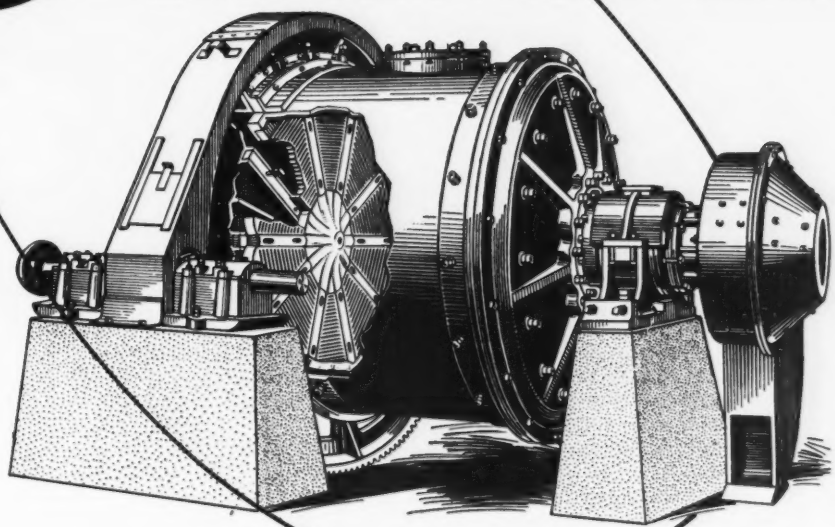
A company spokesman said that the decision results from a controversy with the Atomic Energy Commission over the metallurgy methods suggested for the plant. The disagreement with the AEC was climaxed in late December by the dismantling of the experimental White Canyon Mill which VCA had operated four years.

While AEC officials at Grand Junction, Colo., were reluctant to discuss the matter, a Commission spokesman said:

1. Pilot plant operations and AEC research on the copper-uranium area of the Hite area show greater recovery was possible through the Commission-designed flow sheet,

Worldwide Proof

# of MARCY MILLS' low cost performance



● Grinding mills are selected on the basis of low cost per ton output and efficient, dependable mechanical operation. That's why so many successful mining companies throughout the world use Marcy* Grate Discharge Ball Mills and Marcy Open End Rod Mills. In addition to the many Marcy Mills chosen by both large and small U. S. companies, Marcy Mills have recently been the choice of leading companies (many repeat orders) in the following countries...

CANADA	BOLIVIA	BELGIUM	ENGLAND	NEWFOUNDLAND
CHILE	MEXICO	YUGOSLAVIA	COLOMBIA	BELGIAN CONGO
PHILIPPINES	IRELAND	NEW ZEALAND	PERU	KENYA, E. AFRICA
ITALY	MOROCCO	GREECE	FRANCE	KUWAIT
AUSTRALIA	SO. RHODESIA	NOVA SCOTIA	AUSTRIA	

● Marcy Mills have also been sent to...

JAPAN	BRAZIL	PORTUGAL	KOREA	HONDURAS
ALASKA	EL SALVADOR ECQUADOR	SWEDEN	RHODESIA	INDIA
CUBA	VENEZUELA	ARGENTINA	NEW CALEDONIA	
CHINA	FINLAND	TURKEY	FIJI ISLANDS	

Get the ***facts***, actual operating data, on low cost per ton Marcy Mill performance from our grinding specialists.

*Both Marcy and Massco are Registered Trademarks

The Mine & Smelter Supply Co.

DENVER 17, COLORADO

OFFICES IN SALT LAKE CITY, EL PASO, 1775 BROADWAY, N.Y.C.

REPRESENTATIVES IN FOREIGN COUNTRIES

E. A. GODOY & CO., INC.
CUNARD BUILDING, 25 BROADWAY
NEW YORK 4, N. Y.

SALES AGENTS
REPRESENTING PRODUCERS OF
CHROME ORES IRON ORES
MANGANESE ORES

Utah *(Continued)*

rather than through methods on which VCA insisted.

2. The AEC buys the ore from the owner, paying him for the uranium metal in the ore. If the full value of that ore is to be realized, recoveries of more than 90% must be made from the reduction of the material, or the taxpayer suffers major losses.

Technical aspects of the disputed recovery methods were held to be classified information.

WISCONSIN

● **Davis Mining Enterprises** has started construction of a jig and flotation mill on its Arthur lease just outside Linden.

The Davis enterprise is being financed in part by a $220,000 loan from the Reconstruction Finance Corp. to fulfill a DMPA floor contract granted April 2, 1952, for the production of 6000 tons of 60% zinc concentrates price to be based on 15½c market price for slab zinc.

Under lease to Davis Mining Enterprises are more than 500 acres of mining land, held in 7 leases, all within 5 mi of Linden. 300,000 tons of proven ore in the 7 leases reportedly average 5% zinc as sulfide with minor amounts of lead.

First ore will be mined from the Kickapoo and Arthur leases. The Arthur lease is the site of the old Robart and Hinkle mines, used in Grant's Geological Reports as the perfect example of the double pitch orebody typical of this district.

The Robart mined lead at the top of the pitches while the Hinkle mined zinc at the bottom of the north pitch in the oilrock and glassrock formations at the contact of the Galena and Platteville members of the Ordovician limestone.

Kickapoo ore is an extension of the Hinkle and connects with the Optimo #3 mined by Wisconsin Zinc Co. Last work done in this area was in 1932.

● **Three mining companies in addition to Davis Mining Enterprises** are at present operating in the Wisconsin-Illinois lead-zinc district—all others having closed down due to the fall in price of these two metals.

Vinegar Hill Zinc Co., Shullsburg; Calumet & Hecla Consolidated Copper Co., Calumet Division, Wisconsin Branch, Shullsburg; and Tri-State Zinc, Inc., Galena, Ill., are presently mining.

Eagle-Picher Mining and Smelting Co., Galena, is keeping its Graham Mine and its Birkett Mine dewatered, employing a skeleton crew. Eagle-Picher has done no mining in this district since the disastrous fire which destroyed its power plant at the Graham Mill in May 1953.

IN CANADA

MANITOBA

● **Hudson Bay Mining & Smelting Co. reports discovery of a new orebody** at Phil Lake, Sask., approximately 13 mi southwest of Flin Flon, Manitoba. The discovery consists of two parallel orebodies separated by about 200 ft of lower grade material.

● **Manitoba Chromium Ltd.**, subsidiary of Hudson Bay Exploration & Development Co. plans a magnetometer survey of its holdings in the Bird River area early in 1954. Previous surface work and drilling showed material carrying 15.9% chromium and 13.9% iron.

● **ASFE Mines has ratified an agreement** with Hudson Bay Exploration & Development under which 25 leased claims in the Flin Flon area will be explored by H.B.E. & D. for copper and zinc possibilities.

● **Nor-Acme Gold Mines Ltd.** whose property at Snow Lake is operated under lease by Howe Sound Exploration Co., reports that the shaft is being deepened to 1970 ft.

● **Conwest Exploration Co. Ltd.** has optioned 80 claims in the Bird River area of southeastern Manitoba to explore copper-nickel prospects.

ONTARIO

● **A brand new base metal camp** has been just about assured for Ontario by diamond drilling at the property of Geco Mines in the Manitouwadge Lake area. The Geco deposit, moreover, ranks as the province's first major copper-zinc orebody.

Drilling to date has indicated ore in volume of better than 10,000 tons per vertical ft. It's too early to talk about average grade, but it looks promising.

The area, north of Lake Superior and some 60 mi southeast of Little Long Lac, is 20 mi from the nearest railway, and without roads. However, the coming season will undoubtedly see it quickly opened up. Geco is strongly financed, a 44% interest being held by Consolidated Howey Mines. Diamond drilling and other exploration will be continued throughout the winter.

● **Sparked by the Geco discovery, a large scale staking rush has started in the new area,** and a lot of companies soon will be active in the neighborhood. Among the early-foot arrivals are Lun-Echo Gold Mines, West Geco Mines (adjoining the main show to the west), New Mosher Longlac Mines, Orchan Uranium Mines, Oklend Gold Mines, Roche Long Lac Gold Mines, MacLeod-Cockshutt Gold Mines, Kenogamisis, Chellew Mining Corp., and others, as well as many private interests. Staking already covers an area many square miles in extent.

● **Large-scale activity is being witnessed, too, in Ontario's new uranium field at Blind River,** north of Lake Huron. The two most advanced properties are those of Pronto Uranium Mines and Algom Uranium Mines, the latter controlled by Preston East Dome Mines; but dozens of other organizations hold large acreages along the favorable contact. Pronto and Algom have each outlined large tonnages by drilling; grade is not high, but it is hoped that a special uranium price will enable plans to be made for production.

● **Production plans will possibly materialize this year for Ontario Pyrites Co.** at its big property in the center of the Sudbury Basin. Latest reports from the Ventures-controlled operation show ore reserves increased to 10-million tons; most of the increase coming from the Vermilion Lake mine where recent drilling has outlined 2.2-million tons averaging 1.64% copper, 1.15% lead, 4.62% zinc, 1.81 oz. of silver, and 0.02 oz gold per ton.

Milling plans are being considered on basis of an initial rate of 1,500 tons daily, with Falconbridge's new roast-leach process to be incorporated. New financing of close to $7-million will be required.

● **Milnet Mines,** controlled jointly by Moneta Porcupine (45%) Berens River (30%) and Jonsmith Mines (25%), is making good profits from the mining of its ore. Rapid progress is being

You can get latest Hard-Facing know-how in *either* language!

The Stoody HARD-FACING GUIDE-BOOK is a recognized manual covering hard-facing procedures for heavy equipment. A complete chapter is devoted to the best methods of prolonging life of mining machinery.

To best serve our next door and overseas neighbors, this helpful manual is now published in Spanish as well as English. The profuse illustrations simplify all hard-facing techniques, enabling you to get more service from your equipment. Write for your copy today!

STOODY COMPANY
11940 East Slauson Avenue Whittier, California

STOODY COMPANY 11940
Whittier, California

Gentlemen:

Please send without cost ☐ copies of the STOODY GUIDEBOOK. ☐ Spanish Edition ☐ English Edition.

Name_____

Title_____

Company_____

Street_____ **City**_____

Country_____

Ontario *(Continued)*

made in retirement of pre-production loans, and it is likely that dividends will be started this spring.

The company was formed to mine out two orebodies on the Jonsmith properties, the Milnet ground going to a depth of only 500 ft. The ore in question was estimated to contain 200,000 tons with grade 1.6% copper and 1.54% nickel, and arrangements were made to ship to the Falconbridge concentrator at a rate of 500 tons daily. Approximately 50% of the known ore has now been mined.

● **A new exploration venture is in prospect for the Kirkland Lake camp** where the Toburn Mine, closed down last spring, is to have further testing. The new owner, Albert Metals Corp., subsidiary of Ascot Metals Corp., plans both surface and underground drilling in the hope that additional ore may be found. The property is equipped with a 150-ton mill which is being held intact against the possibility that it may be needed again.

● **D'Eldona Gold Mines has acquired a columbium-uranium prospect and has started a program of exploratory diamond drilling.** The ground is in Butt and Proudfoot Twps., near Algonquin Park about 14 mi from Kearney. The columbium-tantalum values are carried in pyrochlore, found in surface prospecting along a well defined pegmatite dike.

● **Mark down another casualty for Ontario gold mining** in the closure of Paymaster Consolidated Mines, veteran Porcupine producer. In spite of the benefits of cost-aid the company has suffered an operating loss in each of the past two years, and the management decided to close rather than go more deeply into the red; some 335 men were affected.

The property is by no means worked out and probably will be re-opened when gold mining conditions improve. At mid-1953 ore reserves were calculated at 500,000 tons averaging 0.241 oz gold per ton.

● **The enlarged development program undertaken last year by Upper Canada Mines** in the eastern section of the Kirkland Lake camp gave encouraging results, and the company was able to end the year with ore reserves unimpaired despite a new high of 180,000 tons milled. Production was lower, and costs continued upward, but an increase in cost-aid enabled the company to hold earnings at about the 1952 rate.

● **Lateral work is in progress on both the first and second levels** from the recently completed new shaft of Jardun Mines, lead-zinc prospect in the Algoma district about 18 mi northeast of Sault Ste. Marie.

Results of the first work in ore are reported well up to indications. The company is already looking forward to production and has purchased most of the equipment for a mill; initial ore treatment will be at a 100-ton rate, with provision made for easy expansion to 300 tons should the step be warranted.

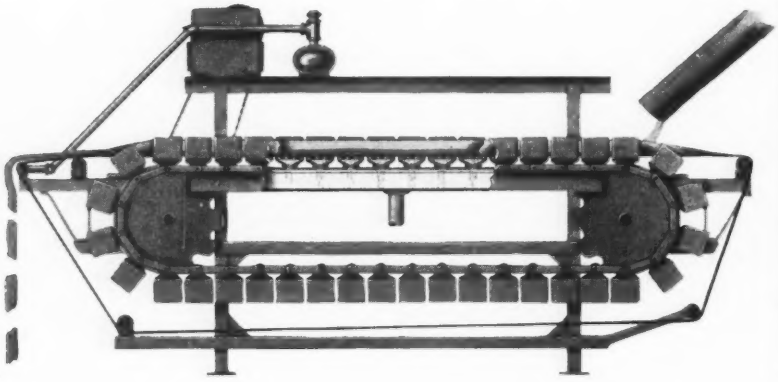
● **Diamond drilling** was started last month on the uranium-tantalum-columbium prospect of Cubar Uranium Mines in the Sudbury District about 12 mi southwest of Copper Cliff. The ground was tested some years ago for feldspar and mica, but had been idle from that time until a few months ago when renewed exploration disclosed signs of the metals for which it is now being drilled.

QUEBEC

● **It looks as though another asbestos producer will be added to Quebec's list.** Lake Asbestos of Quebec Ltd., subsidiary of A.S.&R., proposes plans to erect a mill of at least 4,000 tons on the property leased from United Asbestos Corp. at Black Lake in the Eastern Townships. At latest report the operators were awaiting only the passage by the Quebec government of an order-in-council permitting them to drain the lake for mining purposes.

● **Mill construction at the Chibougamau property of Campbell Chibouga-**

HARDINGE INTRODUCES NEW DEWATERING FILTER OF RADICAL DESIGN



Hardinge Company, Inc., announces the "Tray Belt Filter"—a completely new type of continuous, liquid-solids separating device, which can be used: (1) for relatively fast filtering materials; (2) for washing grains or salts, either by direct or counter-current action; (3) for filtering solids not readily maintained in a fluid suspension prior to filtering, such as coarse sand or materials devoid of supporting slimes.

A simple, sturdy and inexpensive mechanism, the unit consists of a series of connected, traveling, perforated trays in sliding contact with a suction box beneath and supporting a filter cloth which moves with, but is not attached to the trays. The raw liquid-solids mixture is fed by gravity onto one end of this conveyor-like structure. The suction box rapidly removes the liquid from the feed, leaving a dewatered filter cake which drops from the filter at the discharge end at substantially the same elevation as at the feed end.

A washing action may be combined with filtration by use of water sprays above the filter cloth. A counter-current washing action can be obtained by means of a sectionalized suction box and reuse of the wash water from each section in successive sprays, approaching the feed end. Bulletin AH-450-1 describes the new filter in detail.

HARDINGE
COMPANY, INCORPORATED

YORK, PENNSYLVANIA • 240 Arch St. • Main Office and Works

New York • Toronto • Chicago • Hibbing • Houston • Salt Lake City • San Francisco

mau Mines is proceeding on schedule, which calls for the start of production by May 1955, at an initial rate of 1,500 tons daily.

In the meantime, underground development is going ahead normally, with expectation that ore reserves will be increased to 2,300,000 tons to the 1150-ft horizon from the former estimate of 1,150,000 tons to the 750-ft level. Grade is estimated at 3.65% copper and 0.1 oz gold per ton.

● **Campbell, however, will not be Chibougamau's first producer.** That distinction has already been won by Opemiska Copper (Quebec) Ltd., the Ventures subsidiary which started its 400-ton concentrator in December. First milling was at a 200-ton rate, but officials expect capacity to be reached early in 1954. Concentrates are trucked 160 mi to San Felicien.

● **Quebec's next copper producer,** Quebec Copper Corp., should be shipping concentrates well before mid-year, mill construction being well on schedule. The concentrator is designed for daily capacity of 700 tons. The property, financed and controlled by East Sullivan and Sullivan Consolidated Mines, is in Wolfe County, Eastern Townships.

● **Shaft-deepening is just about completed to the 2200-ft horizon at the property of New Calumet Mines,** 70 mi west of Ottawa on the Ottawa River. Deepening was stopped some months ago to permit the company to recover from shortage of finances, and was resumed last fall after operations had been restored to a profitable basis by reduction of tonnage milled to 10,000 tons monthly, with a considerable improvement in grade. It is expected that the ore on the new levels to be established will be reached by early spring.

● **Laying of track on the 360-mi railway** from Seven Islands to the iron ore fields of Labrador-Quebec was to have been completed by the end of January. Last fall it was feared that completion might be delayed because wet weather had hampered operations during the summer, but the lost time has since been made up. Ore shipments are expected to start rolling down to tidewater late in the year.

NEWFOUNDLAND

● **As noted above,** the railway that will service the iron ore fields that lie astride the Labrador-Quebec boundary has now passed the track-laying stage; start of ore shipments is scheduled for late this year.

● **One of the biggest season's work on record for one company was done in 1953 by British Newfoundland Corp.** in the geological reconnoitering of 47,000 sq mi of ground held under prospecting concession. Most of the territory covered is on Labrador, with 1,000 sq mi being located in the Province's main island.

Only preliminary reports on the big job have been compiled, but officials describe the results as encouraging. It is stated that indications of iron, copper, and beryl were obtained in Labrador, and copper and asbestos on Newfoundland Island. An enlarged and more detailed program is being laid out for the 1954 season.

SASKATCHEWAN

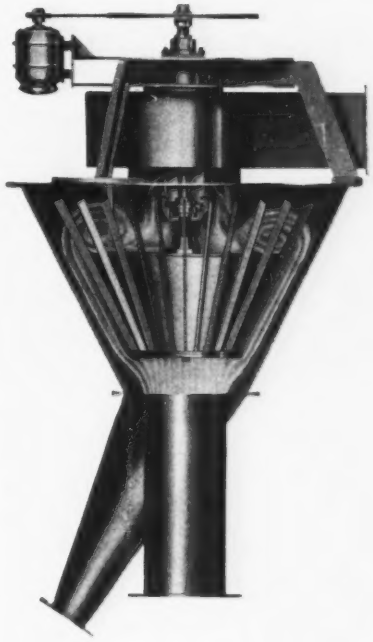
● **Jackson Basin Mining Co.,** which has deferred mill construction at its silver-lead-zinc property in British Columbia's Slocan area pending higher base metal prices, is exploring an uranium prospect in the Beaverlodge camp.

The company has optioned the Judy Group of claims 12 mi north of Uranium City and 2 mi southeast of Taz Bay. A. R. Allen, consulting engineer, said he has traced three strong uranium-bearing structures from the adjoining Chad Group across the Judy and that geological conditions accompanying the structures are identical to those accompanying all major Beaverlodge area uranium deposits.

● **National Explorations Ltd. reports favorable results** in the exploration of the "Pat" group of uranium claims

HARDINGE PLACES NEW TYPE "GYROTOR" AIR CLASSIFIER ON THE MARKET

Hardinge Company, Incorporated, announces a completely new type of dry classifier—the "Gyrotor" Air Classifier, for use in continuous separation of coarse and fine air-borne particles. It can be used in closed circuit with a pulverizing mill or as a self-contained sizing unit for any moving stream of air-solids mixture.



The classifier is basically an inverted, truncated-cone shell with a motor-driven, bladed rotor of similar shape revolving on a vertical center axis inside the outer shell. The raw mixture of coarse and fine air-borne material is fed in from the bottom of the cone, passes upward in the annular space occupied by the whirling blades, describes a doughnut-shaped motion above the rotor, and discharges through a central opening in the top. Oversize not removed by the impact of the blades drop out in the eddy current above the rotor and centrifugal action deposits it on the outer shell of the classifier, where it slides to the oversize discharge at the base of the shell. The returning oversize is definitely cleaned of fines due to the winnowing action of the rotor blades in the annular space.

The classifier has a wide range of fineness control, and adjustment of product size is made simply by changing the rotor speed.

Hardinge Bulletin AH-449-1 describes this new classifier in detail.

HARDINGE
COMPANY, INCORPORATED

YORK, PENNSYLVANIA • 240 Arch St. • Main Office and Works

New York • Toronto • Chicago • Hibbing • Houston • Salt Lake City • San Francisco

Designed for its Environment
Black Lab and SKOOKUM slusher block

He's big, rugged, loaded with endurance, that Black Labrador Retriever. As much at home in the water as he is on land. Steady under the gun. A perfect example of breeding for the environment...*as is the SKOOKUM 708S Slusher Block.* This block, designed specifically for slusher mining, provides an extremely wide throat, can be picked up by magnets. Because of the SKOOKUM patented grease seal it operates flawlessly in water, muck, dust without damage to its Timken Tapered Roller Bearings. So perfect is the design of this and other SKOOKUM slusher blocks it is no wonder more operators specify SKOOKUM.

THE SKOOKUM COMPANY, INC.
8504 N. CRAWFORD ST PORTLAND 3, OREGON

Saskatchewan *(Continued)*

adjoining the main operation of Eldorado Mining & Refining Ltd., Beaverlodge Lake. Diamond drilling on "C" structure indicates a mineral strike length of 680 ft, open at both ends and a length on the dip of 260 ft, also open. Crews this year have drilled 7750 ft; 34 intersections of the main orebody reportedly show widths of one to 265 ft and values from $5.80 to $100.05 a ton based on value of $7.25 a lb for U_3O_8. A truck road has been completed from the "C" shaft to the Eldorado Mill.

BRITISH COLUMBIA

● **Cassiar Asbestos Corp.** announced January 14 that exploration in British Columbia has uncovered an estimated 7-million tons of asbestos ore, enough to supply a 500-ton mill for 40 years.

It has placed orders for an aerial tramway nearly 15,000 ft long to take ore from the mine site to the mill. It's scheduled for completion in late September. Dry Rock storage building will hold 40,000 tons of ore—about 80,000 tons already are stockpiled.

Cassiar Mine, about 70 mi south of the Yukon border, is considered one of the largest sources of long fiber asbestos in North America. A permanent town site has been established.

● **Zinc production has been cut back 25% by Consolidated Mining & Smelting Co. of Canada** at its Trail smelter because of unfavorable market conditions. Closing of Cominco's zinc oxide plant and one slag furnace will mean a cut of 130 tons of slab zinc daily and a layoff of more than 200 workers. About 300 men were laid off during the autumn as a result of unfavorable market conditions. The zinc-lead price drop has also forced a number of base metal mines in the Nelson area to curtail production or close down.

● **Smelter workers at Trail, meanwhile, have rejected a union-sponsored scheme** to cut the work week from 42 to 40 hours a week with less take-home pay to save the jobs of the 200 being laid off. The men, members of Mine-Mill, voted down the union executive proposal by 1227-1033.

● **Trail local of International Union of Mine, Mill & Smelter Workers has turned down an invitation to join an American-led revolt** against alleged Communist leadership of the union. In Canada, Mine-Mill has for some time been expelled from the Canadian Congress of Labor as Communist-led, and after locals at Butte and Anaconda, Montana, quit Mine-Mill, asking United Steelworkers for a local charter, Charles Millard, CCL vice-president and head of Steel in Canada, invited the Trail workers to follow suit. Steel previously has attempted

"DON'T THROW SPEARS AT THAT AIRPLANE!"

is an entertaining anecdotal story by *The Saturday Evening Post* about the work of AERO mappers all over the world. We think it will have interest for our friends in the mining industry. Your request will bring you a copy quickly.

AERO SERVICE CORPORATION
Oldest Flying Corporation in the World
PHILADELPHIA 20, PA.

Kleenslot VIBRATOR SCREENS

They can be DESIGNED AND ADAPTED TO FIT ANY MAKE OF VIBRATOR. Perfect separation on wet or dry screening. Accurate performance on hundreds of installations.

HERE'S HOW IT'S DONE

Cross section at left shows how KLEENSLOT Screens operate on a non-clogging principle.

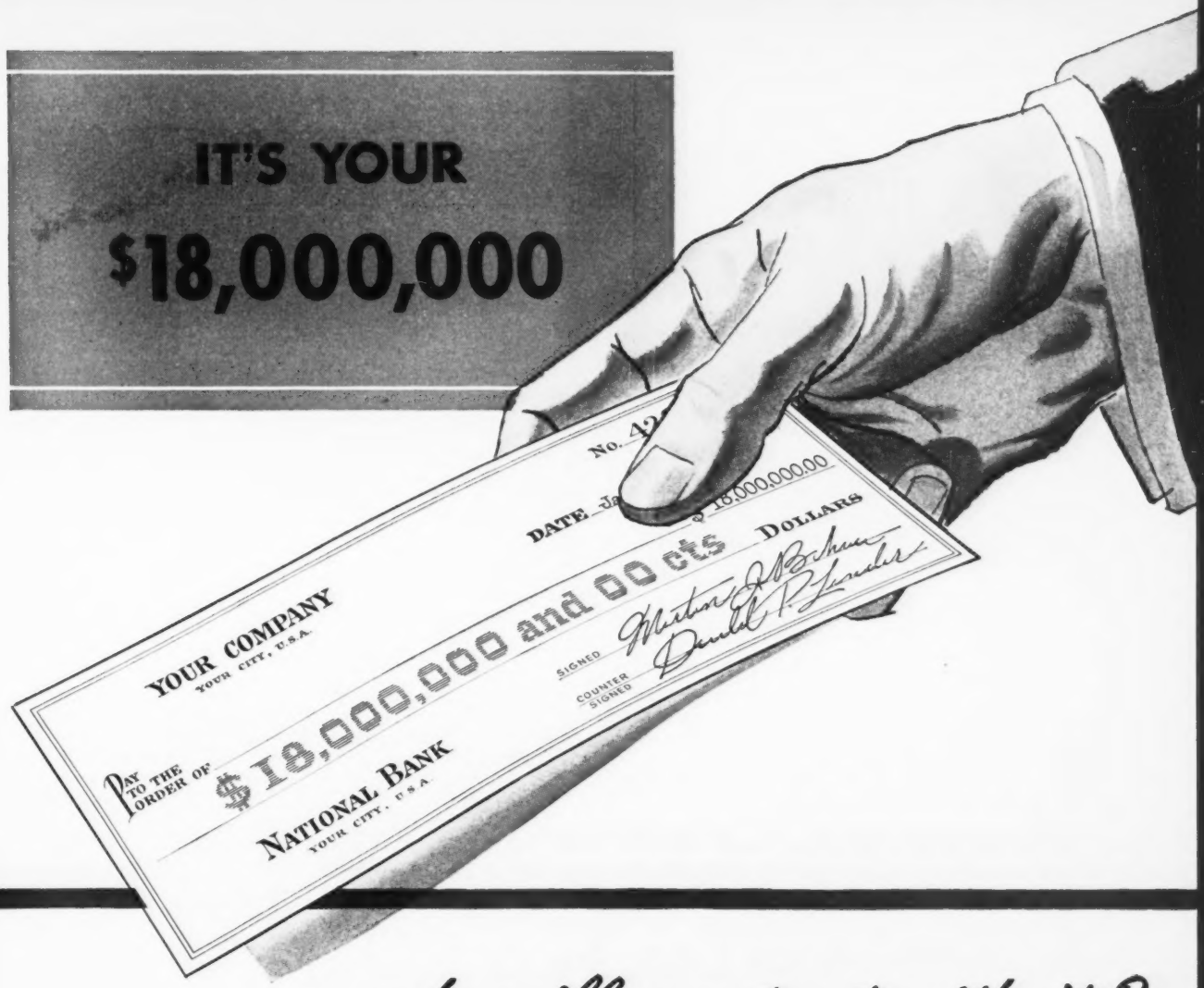
Kleenslot SCREEN GUARDS

The screen guard is built into the screen and the guard bars permit only the finer particles to pass over the screen. All sizes and most materials furnished.

SEND FOR OUR ILLUSTRATED LITERATURE

Wedge-Wire CORPORATION
5602 CLARK AVE. CLEVELAND 2, OHIO

IT'S YOUR $18,000,000



... who will you trust with it?

WHEN your company invests that kind of money in new plant construction you will have to have confidence—a lot of confidence—in the people you trust with the job.

You can find plenty of evidence of complete confidence in McKee among some of the world's largest corporations in the industries we serve. Most of the big names in these industries have called on us again and again for McKee design, engineering and construction services . . . the type of sound thorough efficient services you want for *your* money.

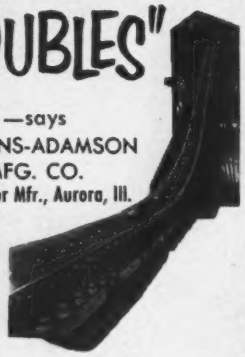
McKee Engineering Services

Arthur G. McKee & Company • Engineers and Contractors

Headquarters: McKee Building • 2300 Chester Avenue • Cleveland 1, Ohio
Offices: New York • Tulsa, Oklahoma • Union, N. J. • Washington, D. C.
British Representatives of Metals Division: Head, Wrightson & Co., Limited
Canada: Arthur G. McKee & Company of Canada, Ltd., 350 Bay St., Toronto

"NO MORE LUBRICATION TROUBLES"

—says STEPHENS-ADAMSON MFG. CO.
Conveyor Mfr., Aurora, Ill.



"LUBRIPLATE Lubricants satisfy the 'one-shot' requirements of our conveyor idlers. LUBRIPLATE effectively lubricates each bearing in turn and flows through the hollow shaft to the next bearing. We do not know of a single case of bearing trouble through faulty lubrication where LUBRIPLATE has been used."

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE GREASE AND FLUID TYPE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

LUBRIPLATE is available in grease and fluid densities for every purpose... LUBRIPLATE H. D. S. MOTOR OIL meets today's exacting requirements for gasoline and diesel engines.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Send for free "LUBRIPLATE DATA BOOK"... a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

British Columbia *(Continued)*

to move into Trail but has lost out in government-supervised voting.

● **Tunnel crews have completed the 10-mi long Kemano power tunnel in the Aluminum Co. of Canada Kitimat project** after a 21-month drive in which they shattered all previous records. The men removed 2,300,000 tons of rock constructing the 25-ft dia. horseshoe-shaped tunnel and during the job four times topped their own efforts, one crew advancing 282 ft in six days, with a record advance in one day of 61 ft. Remaining work to be done in the tunnel includes lining of some sections and laying of concrete flooring throughout the entire length. So far, Alcan has poured $150-million into the project. Latest report on the Canadian National Railways line from Terrace to Kitimat is that it will be operating by Nov. 1, 1954.

● **Final results of surveys of the Atlin Lake-Yukon River basin for a mammoth hydroelectric-metallurgical development** are expected to be known in February, according to officials of Quebec Metallurgical Industries, which is participating in the scheme with Frobisher Ltd. and Ventures Ltd. Surveys are now being analyzed, and according to Ross Tolmie, QMI director, if results are favorable and government permission is granted for the $1-billion Yukon-B. C. development, construction could begin this year.

First ores to be processed at a pilot plant at Tulsequah on the Taku River on the Canadian side of the Alaskan Panhandle would be cobalt and titanium from the Celebes in the East Indies. Titanium from the Klukwan deposits in southern Alaska and from other points on the west coast also is being considered. The hydro development would cover an estimated 25,000 sq mi and produce an estimated 4,500,000 hp. First installation, which would power a small-scale pilot plant, would develop about 25,000 hp.

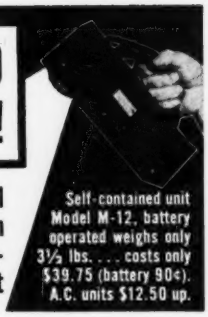
● **In the race for use of Yukon-B. C. hydro resources,** the Canadian government, through Resources Minister Jean Lesage, has reiterated its stand against permitted export of power in the north but has stated the Aluminum Co. of America might be given a chance to develop Yukon River power —provided it forms a Canadian company and builds its manufacturing plant in Canada.

The statement followed a statement by B. C. Premier W. A. C. Bennett that the B. C. government was unprejudiced as to whether Canadian or American capital developed the Yukon system. It is expected representations soon will be heard both from the Ventures group and Alcoa on the matter.

● **Estella Mines Ltd. has ordered preparation of its mine at Wasa for early resumption of production** following reports of engineers that work

FUN AND PROFIT!

Find Unusual Minerals...Hidden Wealth with Ultra-Violet Mineralight



Self-contained unit Model M-12, battery operated weighs only 3½ lbs. . . . costs only $39.75 (battery 90¢). A.C. units $12.50 up.

Mineralite instantly locates and identifies scheelite, uranium, mercury, zirconium and other hard-to-find minerals . . . opens new, exciting, and interesting worlds of gorgeous colors. You'll find a reasonably-priced Mineralight unit invaluable whether you're prospecting seriously or as a hobby.

Ultra-Violet Mineralights are used by hobbyists and engineers the world over . . . for prospecting, ore-sorting, core analyses, mineral displays, industrial inspection, chemical analysis, and in laboratory techniques. Long-wave and short-wave units.

Write NOW for full information and name of nearest dealer.

ULTRA-VIOLET PRODUCTS, INC.
145 Pasadena Avenue, South Pasadena, California

Diamond Core Drilling

Mineral Exploration

Foundation-Test Drilling

Grouting

More than 15 years experience with trained crews.
Estimates on request.

Tinney Drilling Company
113 W. Main St.
Grafton, W. Va.
Phone 130

Eimco Loaders handle the hard abrasive ore at the rate of 2 tons per minute. Ore weighs as much as 7 to 8 cubic feet per ton.

16 TO 18 TONS PER MAN SHIFT

Yes! 16 to 18 tons per man shift — including everybody on the payroll — are being loaded in hard abrasive ores with Eimco loaders in a drawpoint loading system.

Many other companies are studying their mine development programs to adopt this most efficient method of lowering costs and increasing tonnage.

Eimco will be happy to provide a group of sketches made at different properties to show what has been done in different mines.

The use of the Eimco loader in drawpoints speeds up development time, eliminates the expense of timbered chutes and grizzly level development work, saves on powder and increases the safety of operation.

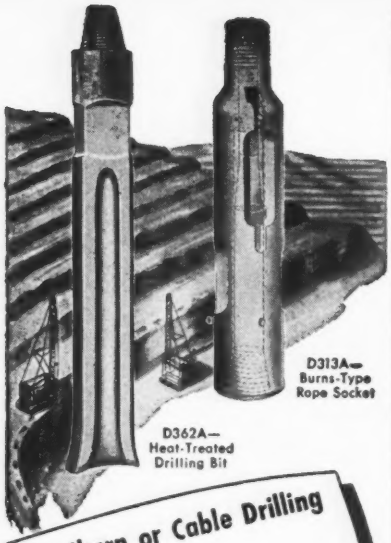
Eimco Engineers will be glad to discuss mechanical loading from drawpoints with no obligation to you. Write The Eimco Corp., P. O. Box 300, Salt Lake City 10, Utah.

EIMCO

B-10

THE EIMCO CORPORATION
Salt Lake City, Utah, U.S.A.
Export Office: Eimco Bldg., 52 South St., New York City

You Can't Beat An Eimco

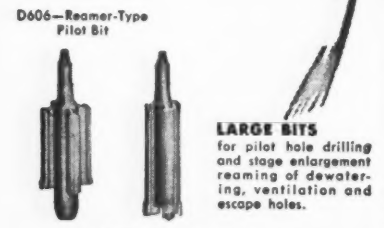


For Churn or Cable Drilling of

• BLAST HOLES
• PROSPECT HOLES
• SAMPLING

SAFE • EFFICIENT • ECONOMICAL

Spang Churn or Cable Tools are top performers in their fields for drilling test holes when prospecting or sampling . . . drilling blast holes for fragmentation of minerals or overburden . . . drilling and reaming escape, dewatering and ventilating holes . . . and drilling wells for other purposes. Fifty years' experience serving oil, water-well, mining and quarrying operations assures their value.



LARGE BITS
for pilot hole drilling and stage enlargement reaming of dewatering, ventilation and escape holes.

SPANG CABLE TOOLS
made by
SPANG & CO., BUTLER, PA.
for
• SHOT BLAST HOLES • WELL DRILLING
• PROSPECT DRILLING • SAMPLING

British Columbia *(Continued)*

done indicates the lead-zinc orebody persists to depth. Production plan is based on calculated average net smelter returns of $24 a ton at present prices, and it is believed costs can be kept under $7 per ton. Initial operation will be 200 tons daily, rising to 300 tons. Exploration and development will continue.

● **Development work on the new Granduc copper property** in B. C.'s northern coastal area will hit its stride this spring under the direction of two New York mining firms. Newmont Mining Corp. of New York is joining with Granby Consolidated Mining, Smelting & Power Co. in developing the Granduc Mines Ltd. property near Leduc Glacier at the head of Portland Canal. Granby, which operates Copper Mountain mine and Allenby smelter near Princeton and has its head office in New York, has spent $200,000 on Granduc and has undertaken to spend about $40-million over a period of years as development and discoveries justified.

Under a new agreement Newmont has put up $250,000 and will take over about half of the Granby commitments for a half interest. Newmont operates the Island Mountain and Sunshine Lardeau mines in B. C. and is developing the Western Nickel mine near Hope. Granby and Newmont are preparing to airlift supplies to the Granduc property this winter to be ready for the spring program. Copper content of Granduc ore is 2%, well above average.

● **Columbia Gypsum Products Inc. shipped almost double its 1952 production** in the 12 months ended Nov. 30. Shipments totaled 60,000 tons, compared with 35,000 tons the previous year. The company has 83 claims extending from Kootenay River at Canal Flat to Kootenay Park boundary, an area 35 mi long.

● **Canam Copper Co. reports ore averaging 2% copper** across 45 ft in the third intersection of the new orebody on No. 7 level, slightly below the No. 6 level elevation at its property adjacent to the Hope-Princeton highway. Bulk samples representative of 5-ft sections across the orebody averaged 2% copper, 0.035 oz gold and 1.29 oz silver per ton.

IN AFRICA

● **Kennecott Copper Corp, has advanced additional loan capital of $14-million** to the Merriespruit Gold Mine in the Orange Free State. This will be sufficient to bring the company to production with a milling capacity of 75,000 tons a month.

Merriespruit will issue $14-million of 3% unsecured convertible loan stock at par to Kennecott. After issuance of the new stock, Merriespruit will have total available capital of

BIN Stuck Lately?

Mines everywhere have found CLEVELAND air vibrators the solution to their arching, bridging and sticking problems.

With a CLEVELAND, materials move through handling devices efficiently and economically, thus cutting down production time and costs.

We have a size and type, either quiet or standard, to fit your requirements.

Write for our new catalog No. 109.

THE CLEVELAND VIBRATOR COMPANY
2834 Clinton Ave. • Cleveland 13, Ohio

STOP RUST! with RUST-OLEUM®

BEAUTIFY AS YOU PROTECT YOUR RUSTABLE METAL SURFACES

Save costly buildings, draglines, pumps, machinery, equipment, etc! Just scrape and wirebrush to remove rust scale and loose rust—then apply RUST-OLEUM 769 Damp-Proof Red Primer directly over the remaining rust. Follow-up with desired RUST-OLEUM finish colors to beautify as you protect. RUST-OLEUM's specially-processed fish oil vehicle penetrates rust to bare metal and resists rain, sun, snow, heat, fumes, salt water, weathering, etc. Consult your local classified telephone directory under Rust Preventives or Paints for your nearest source of supply, or clip coupon to your letterhead, *today!*

RUST-OLEUM CORPORATION
2446 Oakton Street • Evanston, Illinois

APPLY DIRECTLY OVER SOUND RUSTED SURFACES

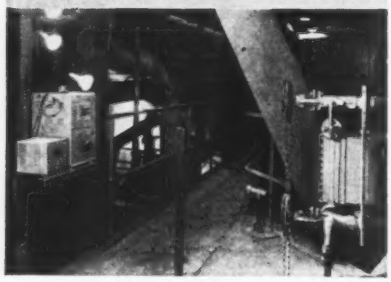
AVAILABLE IN MANY COLORS, INCLUDING ALUMINUM AND WHITE

CLIP THIS TO YOUR LETTERHEAD
MAIL TO: RUST-OLEUM CORPORATION
2446 Oakton Street • Evanston, Illinois

- ☐ Have a Qualified Representative Call
- ☐ Full Details on Free Survey
- ☐ Complete Literature with Color Chips
- ☐ Nearest RUST-OLEUM Source

NOW You Can *See*
Where You Can't *Look*

5 YEARS of CONTINUOUS OPERATION
PROVE Dependability OF
DIAMOND "UTILISCOPE"
(WIRED TELEVISION)

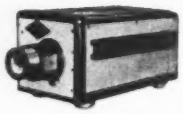


"UTILISCOPE" *camera at drum elevation SEES actual boiler water level.*

In 1948, Tidd Plant of Ohio Power Company (subsidiary of The American Gas & Electric Company) installed a Diamond "Utiliscope" so that the operator at the control panel could SEE the boiler water gauge several floors above. The camera location (adjacent to the big boiler drum) is hot and dusty. Auxiliary machinery causes vibration. The installation (including the original camera tube) has been in continuous use . . . 24 hours a day . . . 7 days a week for over 5 years, with very little maintenance. This is the first system of industrial television purchased in the U.S. and is still in continuous operation.

Probably there are places in your plant where you can use the DEPENDABLE "Utiliscope" (wired television) . . . the great new industrial aid. It is saving money and improving operations in steel mills, power plants, foundries, coal mines, and a wide variety of manufacturing plants. Use the coupon below.

"Utiliscope" Receiver



"Utiliscope" Camera

6702

SEND TODAY

DIAMOND POWER SPECIALTY CORP. H
LANCASTER, OHIO

Please send me without obligation a copy of new Bulletin No. 1136 showing how the Diamond "Utiliscope" (Wired Television) is being used to cut costs, improve operations and promote safety.

Name_____
Company_____
Address_____

DIAMOND POWER SPECIALTY CORP.
FIRST IN INDUSTRIAL TELEVISION
LANCASTER, OHIO
OFFICES IN 39 PRINCIPAL CITIES
Diamond Specialty Limited—Windsor, Ontario
SINCE 1903, DIAMOND HAS MANUFACTURED QUALITY EQUIPMENT FOR INDUSTRY

Africa *(Continued)*

some $25-million, of which Kennecott reportedly will have contributed more than $20-million. Kennecott also has substantial interests in the adjoining Virginia Mine.

● **American Metal Co. and American Potash & Chemical Co.** together with Selection Trust of London reportedly are providing funds to exploit a lithium-beryllium property near Fort Victoria in Southern Rhodesia.

● **Preliminary samples taken in the new Southern Rhodesian uranium field** just across the Transvaal border reportedly all have proved positive. Some are stated to have assayed .5% uranium oxide. This is reputed to be considerably higher than that obtained from Witwatersrand gold mines.

Two areas of radioactive minerals have been mapped and a third and larger area has been pegged. Other minerals reported include apatite, feldspar and lithium ores. It was estimated that the plant necessary to recover uranium will cost about $3-million.

● **Discovery of about 200-million tons of soil** harboring workable quantities of apatite and pyrochlore has been reported in Tororo, Uganda, a British protectorate in east Africa.

Announcement of the discovery was made by Tororo Exploration Co., an enterprise reportedly controlled by Monsanto Chemicals Ltd., Frobisher, Ltd., and the Uganda Development Corp.

Tororo officials said that the discovery probably would give rise to a new mining operation from which columbite, fertilizer bases and perhaps, uranium, will be extracted.

● **A new mill for concentration of eluvial and metallurgical grade chromium ore** from the properties of Vanadium Corp. of America in Southern Rhodesia has just been placed in operation.

Through its wholly-owned subsidiary, Rhodesian Vanadium Corp., VCA owns in the great Dyke region of Southern Rhodesia extensive deposits of chrome ore from which it manufactures ferrochromium and chrome-silicon alloys at its plants in Niagara Falls, N. Y., and Graham, West Va.

IN LATIN AMERICA

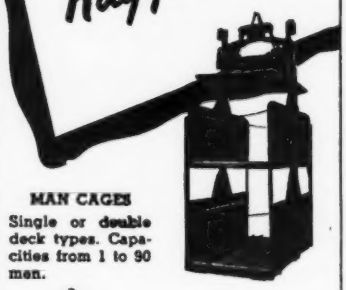
MEXICO

● **What is said to be the first Frasch process sulphur ever to be produced anywhere outside of the United States** has begun to stream from the newly-discovered San Cristobal dome in the steamy jungles of southern Mexico.

The Mexican Gulf Sulphur Co., a local firm backed by U.S. interests

CONNELLSVILLE
(LEPLEY)
Safe MINING EQUIPMENT

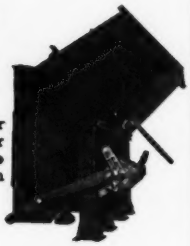
Economical-Rugged!



MAN CAGES
Single or double deck types. Capacities from 1 to 90 men.

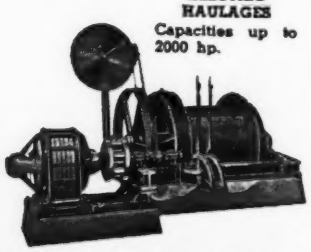
BOTTOM DISCHARGE SKIPS
Built to "take it" in 1 to 25 ton capacities.

SKIP LOADING CHUTES
Operated either by skips or air cylinders. Toggle locked when closed.



SHEAVES
Bicycle type with renewable special steel liners. Up to 16 ft. dia. with plain or anti-friction bearings.

ELECTRIC HAULAGES
Capacities up to 2000 hp.



WRITE FOR COMPLETE DETAILS

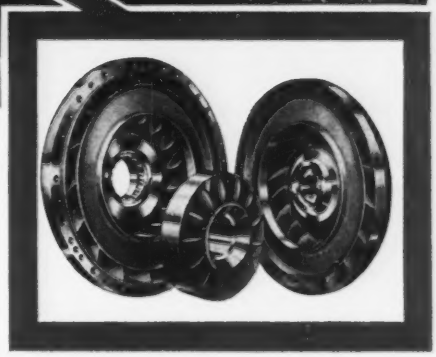
We specialize in all types of equipment to meet your needs

CONNELLSVILLE
MFG. & MINE SUPPLY CO.
CONNELLSVILLE, PA.
"Serving the Mining Industry Since 1901"

...Smoother power!
...Better performance!

with the NEW TORQUE CONVERTER

PAYLOADER®



The big, husky 1½ HM "PAYLOADER", the leader in the field, now further establishes its superiority with the extra advantages of a Torque Converter drive. Gives you extra power for tough going, smoother power at all times, more lugging power, more engine efficiency, for faster, lower cost material handling.

Combined with the 4 speed, full reversing transmission, the Torque Converter provides an unlimited range of automatically selected speeds to meet the load and operating conditions. Parts breakage and maintenance are less because shock loads are absorbed.

More than a year of field testing "on the job" gives you proven performance. It's the finest tractor-shovel available — and we'll prove it! Ask your "PAYLOADER" Distributor for a demonstration or write The Frank G. Hough Co., 726 Sunnyside Ave., Libertyville, Ill.

TORQUE CONVERTER DRIVE

More Efficiency — Engine operates at most efficient speeds — no laboring or stalling

Lower Maintenance — Oil cushion absorbs load shocks — protects vital parts

Easier Operation — Eliminates much gear-shifting and "clutching"

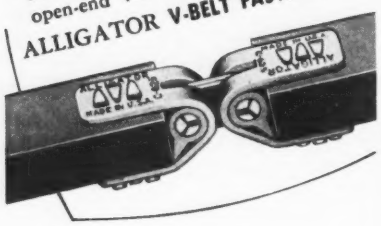
Greater Output — Operates at highest speed in relation to load

SAY "HUFF"

PAYLOADER®

WHICH V-BELT is best for you?

If the correct size of endless V-Belt is not readily available, or if you have to tear down machinery to install, then the best belt to use is open-end V-Belting fastened with ALLIGATOR **V-BELT FASTENERS**



★ In this way you can make up V-Belts in *any length* to fit *any drive* the fast economical way — V-Belts that perform exceptionally well.

★ In contrast to link-type belts these ALLIGATOR fastened V-Belts have just *one* strong joint . . . *stretch and follow-up maintenance are reduced to a minimum.*

ALLIGATOR **INTRODUCTORY V-BELT DRIVE UNITS** contain V-Belting, Fasteners and Tools — everything you need in one compact package to make up V-Belts quickly. Available in sizes A, B, C & D.

Ask for Bulletins V-215 and V-216
Order From Your Distributor

FLEXIBLE STEEL LACING COMPANY
4635 Lexington Street, Chicago 44, Illinois

ALLIGATOR
V-BELT FASTENERS

Mexico *(Continued)*

who obtained a $4,275,000 Export-Import Bank loan, financed the balance of the $6-million cost themselves.

Huge boilers, pumps and steam lines reportedly are in operation and pure sulphur is being pumped from the underground dome into barges where it will be floated downriver to the nearby port of Coatzacoalcos on the Gulf of Mexico. There it can be unloaded, still hot, for transhipment to ocean-going vessels.

The company expects to ship more than 200,000 tons of pure sulphur during its first year of operation. It still has no idea of the extent of the sulphur in its San Cristobal dome except that it is believed to be one of the largest deposits in the world. The deposit also is said to be one of the easiest to work as it is a "perfect dome" which holds hot water without seepage.

This is necessary to carry out the efficient Frasch process which consists of pumping hot water and steam into the dome and securing a stream of dissolved sulphur.

It has long been suspected that the numerous salt domes of Tehuantepec had sulphur. In fact, two other companies associated with Mexican Gulf Sulphur, and financed by Kuhn Loeb and Carl M. Loeb Rhoades & Co., are operating in the same area.

One, the Pan-American Sulphur Co., only about 20 mi from Mexican Gulf, has another salt dome under development in a $7-million project. Pan-American is 50% financed by another Export-Import loan. It is not yet producing. Construction work here is being done by Browne, Roote & Co. of Houston.

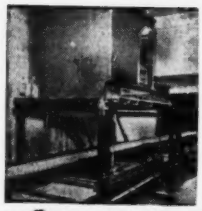
Larence Brady, head of Mexican Gulf Sulphur, says that his firm will start to market its output, beginning at once, throughout the world, shipping direct from the port of Coatzacoalcos on the Gulf. Brady added that he can produce for about $30 a ton which is considerably under the cost of what he calls "high-priced" sulphur now available on the market.

A third Mexican project is being carried out by a third firm, Gulf Sulphur Corp. (no part of the others), at a dome called Mequitzal across the Coatzacoalcos River from the other developments in the Tehuantepec Isthmus. This third development is entirely privately financed through public sale of bonds.

CHILE

● **Norddeutsche Affinerie of Hamburg,** owner of the largest electrolytic copper refinery in Germany, has renewed its contract with the Mining Bank to refine the whole of the blister copper from the Paipote smelter as well as for the smelting of the excess copper ore the Bank will not be able to smelt at Paipote.

WEIGH WITHOUT STOPPING
WHILE YOU **CONVEY**



Yes, weigh and record with the MERRICK

WEIGHTOMETER

The Merrick Weightometer provides a continuous, automatic, accurate weight record at any designated point in the mill, while material is in motion on conveyor. It weighs without interrupting conveyor service. Applicable to any size belt conveyor, horizontal or inclined. An accurate and dependable means of keeping constant check on production.

MERRICK SCALE MFG. CO. PASSAIC N. J.

SCINTILLATION COUNTERS

FIND URANIUM 100 TIMES EASIER

Model 111 (pictured above) . . $495.00
Famous Halross Model 939 . . . 975.00
Airborne Optimum Model SAB-7 . 2810.00

• • • • •

ALL TYPES GEIGER COUNTERS
ULTRA VIOLET LIGHTS
SPECIAL LONG PROBE SCINTILLATION AND GEIGER COUNTERS FOR DRILL HOLES

• • • • •

CARPCO HIGH TENSION AND MAGNETIC SEPARATORS

• • • • •

ENGINEERS SYNDICATE, LTD.
5011 Hollywood Boulevard
Hollywood 27, California

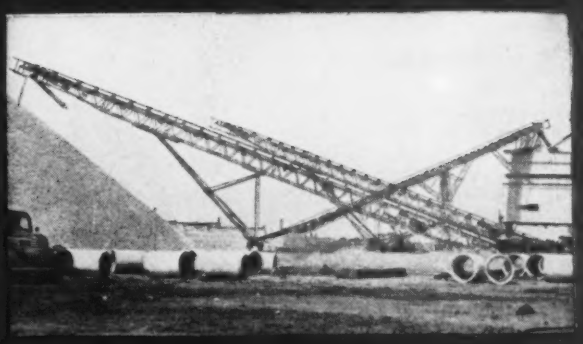
"STACKER"

WHAT TYPE DO YOU NEED IN YOUR BUSINESS?

BARBER-GREENE SUPPLIES THEM ALL

RADIAL STACKERS

Radial stackers have a pivoted receiving end about which the conveyor revolves to load direct to truck, to load to a kidney-shaped pile or to directly into different bins. May be mounted on swivel wheels or on swivel trucks operating on curved rails. Revolving is by hand or power. Furnished in all belt widths to stockpile on grade or 180 feet on curved rail tracks.



TRAVELING STACKERS

As the name suggests, traveling stackers may be moved from one position to another to make stock piles in various sizes and locations. May be mounted on wheels, crawlers or trucks. One popular type is mounted on four wheel trucks to move horizontally to build stock piles in long, straight lines. Traveling Stackers are furnished in all belt widths in lengths of 100 feet.

FIXED STACKERS

The most widely used stacker system. Fixed stackers are designed for applications where the material is to be elevated and discharged from a cantilever position at the head end into a surge pile or a disposal pile. Used on with radial and traveling stackers, the absence of support structures in the surge or stock piles does not interfere with the operation of reclaiming machines. All belt widths and lengths.

Barber-Greene

BG

Aurora, Illinois, U. S. A.

Dredge couplings, dredge discharge hose also available—any size, any length.

Cut costs and up production

WITH AMERICAN heavy-duty hose and belting

AMERICAN air drill hose has heat and oil resistant tube, extra-tough cover to withstand snagging and abrasion.

1. **Tailored To Your Job, At No Extra Cost.** At AMERICAN, each job is treated on an individual basis. You avoid costly "misfits"... get the hose or belt that meets your specific requirements. The result? — improved performance, added service life; *more* for your dollar.

2. **Fast Action.** The whole "works"—management, sales, engineering, laboratory, production—is under one roof. You deal with top management, get action—fast.

Save hours and dollars—call AMERICAN first on your hose and belting needs.

Other AMERICAN custom-built products for mines, dredges and quarries.

- Chute liners
- Elevator belts
- Fire hose
- Fume and ventilating hose
- Pulley lagging
- Gold recovery equipment
- Special molded goods—water stops, gate seals, expansion joints, etc.
- Hose of all types . . . and complete line of mechanical rubber goods.

AMERICAN ribbed center conveyor belt grips and holds both wet and dry, round or angular materials on steeper inclines than any other belt.

THE American RUBBER MANUFACTURING CO.

AR-25

Factory & General Offices:
1145 Park Avenue • Oakland 8, California • Phone OLympic 2-0800

BRANCHES
SEATTLE: Smith Tower, SEneca 1727
PORTLAND: Dekum Building, CApitol 1708
SAN FRANCISCO: 7 Front St., SUtter 1-6068
LOS ANGELES: 711 E. Gage Ave., ADams 1-9279
BOISE: 1116 No. 18th St., Phone 2612
ST. LOUIS: 843 So. Lindbergh Blvd., WYndown 2226

Chile *(Continued)*

● **Mauricio Hochschild & Co. has obtained an option on the well known Mantos Blancos copper deposit** from two of its owners, Instituto Minero e Industrial de Antofagasta and de la Fuente family and will proceed to drill the property.

This deposit, 25 mi from the port of Antofagasta, has been examined by many engineers and some of its richer zones have been mined and the ore hand picked for export but until now it has not been drilled systematically. Surface indications point out that it will probably be a leaching proposition.

● **Secretary for Mines Señor Cuevas** reportedly is hopeful that Santiago Mining Co., a subsidiary of Anaconda, will go ahead with the exploitation of the Africana and Lo Aguirre Mines near Santiago which were opened up some 30 years ago. If these mines are placed in production, the supply of copper ores and concentrates in Central Chile might be sufficient to justify the construction of a copper smelter.

BOLIVIA

● **Resignation of the Board of the Bolivian Mining Corp. has now been accepted** by the Government. A decree announcing the acceptance explains that this marks the completion of the first period of the Board.

The mining corporation was placed in charge of the Patino, Aramayo and Hochschild tin concerns following their nationalization after the revolution of October 1952.

Government sources in La Paz said that the resignation does not imply any change in policy but simply compliance with internal regulations.

Before submitting their resignation, the retiring board drafted new statutes which were approved by the Ministry of Mines.

The Government decree issued here appoints Senor Jorge Zarco Krammer, formerly Minister of Finance and currently Director of the Mining Bank, as president of the new board. Two workers' representatives have joined the board and the Government will be represented through an official of the Exchequer, Senor Guillermo Alcazar. The new board was expected to take office before the end of January.

● **Patino Mines & Enterprises Consolidated Inc.** management told stockholders at a January meeting in New York that it retains little hope of resuming operation of its Bolivian tin mine properties. The Patino properties were nationalized by the Bolivian government in October 1952.

It was revealed at the same time that the firm hopes that negotiations will begin soon between the Bolivian government and Patino officials to establish a fair value and method of payment for the seized properties.

IN THE NEAR EAST

IRAQ

● **Texas Gulf Sulphur Co. and the Iraq Government** were reported in January as being near to signing a 52-partnership agreement in which Iraq will take part on an equal basis in development of potentially rich sulphur resources.

A representative of the Texas Gulf Sulphur Co., when contacted in New York, said that his firm was not prepared to make any statement whatsoever about the proposed agreement.

The contract, which would have to be ratified by the Iraq Parliament, would permit the company to explore the entire country north of the 33rd parallel. After 20 years, the company would be left with a maximum of 1,000 sq km. The proposed agreement is for 50 years. Negotiations reportedly have been going on during the past two years.

If sulphur is found in the hoped-for quantities, Iraq would become an important dollar earner within the sterling area. At the same time, the sterling area would have an important non-dollar source of a vital material, which is now bought from America. One observer thought that the agreement would revolutionize the world sulphur industry.

Maj. Gen. Wildman Lushington, chief executive, Sulphur Exploration Syndicate, was reported from Baghdad as terming the proposed agreement a most encouraging move.

He was quoted as saying that he did not believe that production in commercial quantities could be achieved for at least three years.

After visiting Iraq to study the feasibility of sulphur production, General Lushington reportedly estimated that $60-million would have to be spent on installing a plant at Kirkuk alone where an estimated 80,000 to 100,000 tons of sulphur could be produced annually.

He envisaged that in addition to sulphur, a plant at Kirkuk would produce sulphate of ammonia, carbon black and (from the deposit) some cement. Sulphate of ammonia, he added, would be of invaluable use to Iraq as a fertilizer for irrigation programs.

ISRAEL

● **The Minister of Development,** Dov Joseph, disclosed in Tel-Aviv that new iron deposits have recently been discovered in the Galilee Province (mountainous region, northern Israel). The Minister did not disclose the exact location of the deposits nor did he elaborate on the extent of the deposits.

"IT'S OK. BOYS—THAT HEIL BODY IS BUILT FOR LOAD-SHOCK!"

● Heil Rock Bodies, fabricated of ¼" (or heavier) steel plate with rigid reinforcing provided by box-member ribs and 2" hardwood cushion sandwiched between bottom and wearing plate, will withstand the punishment of handling heavy loads of rock when loaded with big buckets.

● Strong-Arm Hoists raise and hold loads efficiently and dependably. Hoist frame takes all stresses imposed by action of the hoist without transferring any stress to truck frame.

● Heil Bodies and Hoists are individually engineered to your requirements for body length and load distribution.

Write for Bulletin BH-52106.

THE HEIL CO.

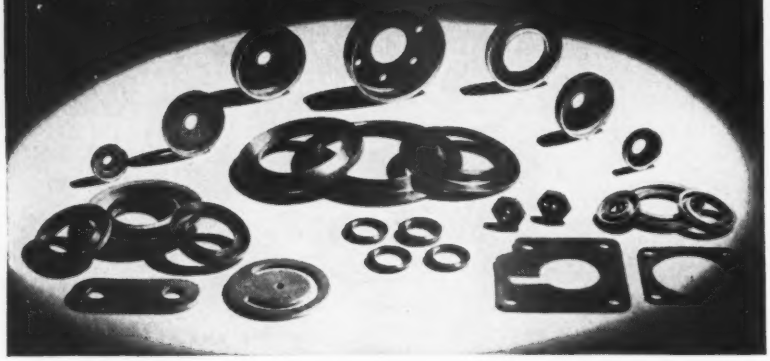
DEPT. 7524, 3075 WEST MONTANA STREET, MILWAUKEE 1, WISCONSIN

Factories: Milwaukee, Wis. — Hillside, N. J.

Sales Offices: New York, Union, N. J., Washington, D. C., Atlanta, Cleveland, Milwaukee, Detroit, Chicago, Kansas City, Denver, Dallas, Los Angeles, Seattle.

ROCK BODY CONTRACTORS' BODY ELEVATING TAILGATES

GARLOCK Service-Tested
LEATHER PACKINGS



Available in ALL SHAPES, ALL SIZES, ALL TANNAGES and ALL TREATMENTS

GARLOCK's modern, completely equipped leather packing manufacturing plant has the facilities to furnish *all types* of leather packings. This plant maintains the same high standards of materials, design, workmanship, and inspection that Garlock has upheld for the past 66 years in the manufacture of mechanical packings.

SHAPES

Molded Cups **"U" Packings**
"V" Packings **Washers** **Gaskets**
Discs **Flange or Hat Packings**

SIZES

All sizes suitable for leather packing applications from ⅛" O.D. (such as leather washers for needle valves) to 99" O.D. (such as large "U" packings for heavy duty hydraulic service).

TANNAGES

Oak **Chrome** **BITAN***
Garlock Bitan combines the heat and oil-resisting qualities of chrome with the fine grain, non-porous, strong qualities of oak.

TREATMENTS

Oil, grease, or wax treated (and combinations of these impregnants)—in degrees of hardness from extremely soft and flexible to very hard and rigid.

Synthetic rubber impregnated—combines the high tensile strength of leather and elasticity of rubber, and gives greater temperature resistance.

With fabric liners.
Untreated—for certain low pressure water applications.

Put your leather packing problems up to Garlock. Contact your Garlock representative or write for leather packing folder today. *Registered Trademark

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK

Sales Offices and Warehouses: Baltimore • Birmingham • Boston • Buffalo • Chicago Cincinnati • Cleveland • Denver • Detroit • Houston • Los Angeles • New Orleans • New York City • Palmyra (N.Y.) • Philadelphia • Pittsburgh • Portland (Ore.) • Salt Lake City San Francisco • St. Louis • Seattle • Spokane • Tulsa.

In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

GARLOCK
PACKINGS, GASKETS, OIL SEALS
MECHANICAL SEALS
RUBBER EXPANSION JOINTS

YEMEN

● **German geologists have discovered gold deposits** in remote and mountainous Kingdom of the Yemen. Gold samples were sent to Germany for chemical analysis. The site was located at Harada, north of the Red Sea port of Hadeidah.

IN ASIA

RUSSIA

● **Russia's Urals area copper industry is in the Soviet doghouse.** The official newspaper *Pravda* has charged that production by Urals mines and smelters has fallen far behind plan. *Pravda* complained also that technological development has not kept pace with other branches of Russia's metallurgical and mining industries.

(Primary copper production for the Soviet Union as a whole is slated to increase 90% under the current (Fifth) Five Year Plan. This would mean boosting output from around 290,000 metric tons in 1950 to over 550,000 metric tons in 1955.)

Pravda listed these complaints against Urals area copper producers:

Mechanization has lagged in a number of processes, including "preparing of materials for smelting, cleaning of blast pipes (tuyeres) of converters, and loading and unloading of copper;"

Temperature control and regulation of smelting operations is not continuous and automatic but intermittent and manual;

Smelters have failed to make use of vast quantities of waste gases to preheat air fed into the furnaces. "In one Central Urals plant alone, waste gas equivalent to heat obtainable from burning 30,000 tons of coal is lost in a year;"

Productivity of converters can be increased 25 to 40% if oxygen blast is used, "but this has not been accomplished in a single Sverdlovsk Province copper plant;"

Large "reserve capacities" at copper plants and mines are not used due to inefficiency. "Thousands of tons of copper and other valuable metals literally fly out the chimneys every year. Scientific-research organizations, which are concerned with these problems, have failed to work out more advanced technological methods;"

Much dissolved copper is carried away by the mines' waste water because of poor methods of recovery. "Much of the equipment intended for such recovery is run-down and neglected;"

Leaching out of copper from depleted deposits has been poorly organized;

Productivity of special equipment is low and is often used only half the possible time. "Because of neglect of hydrometallurgical methods or obtaining copper, its production by this means not only has not increased by

comparison with prewar years but has actually decreased sharply;"

Newest achievements of science and technology are adopted very slowly. Experience and progressive techniques of advanced plants and mines are not imitated by laggard estabishments.

Pravda disclosed that because of low production by copper mines in the Sverdlovsk area, ore must be imported from other regions in large quantities to maintain high-level operations at local smelters.

JAVA

● **It was being rumored in Djakarta that government authorities would welcome foreign private enterprise assistance** in reactivating an old copper mine which otherwise is to be abandoned.

Assays of samples average 1.28%, varying from .03% to 7.11%. Reports did not indicate extensiveness of the deposit. Government officials decided that returns would not justify major appropriations such as the working of the mine would require.

The mine is near Tirtomojo in Central Java. Informed sources say that to put the mine back into production, it would be necessary to build a $200,000 road, to reopen collapsed shafts and to bring in much machinery to replace that destroyed during the Indonesian revolution against Dutch rule.

INDIA

● **Travancore Titanium Products Ltd.,** reportedly the only producer of titanium oxide in India, resumed production in January. It had closed down in mid-1952 because of lack of internal demand for its products.

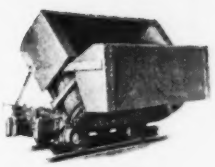
The Indian government helped reopen the plant with a loan of 1.5-million rupees. Annual plant capacity is about 1,800 tons, of which only about 600 tons are absorbed by the Indian market.

● **India, which now imports all sulphur used by its growing industries,** is now investigating the possibility of producing sulphur from native pyrites.

The Mining Section of the Geological Survey of India is exploring Am Jor pyrites in the Shahabad District of Bihar. This exploration has indicated that the pyrite deposits are extensive and of a grade suggesting the possibility of their becoming a substantial sulphur producer.

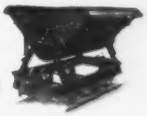
A private firm did preliminary exploration at Am Jor from 1940 to 1951. Then the Geological Survey took over, restarting the work with shaft driving and roof-bolting.

A myriad of difficulties has hampered the undertaking. Roads at best were inadequate and were useless during the rainy season for transporting heavy machinery. All major supplies had to be brought from Cal-


Granby-type Dump Cars

Mining Cars

Tray-type Double Side Dump Cars


Cradle Dump Cars

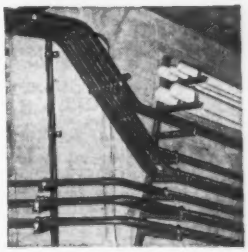
PROVED IN SERVICE

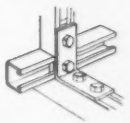
Diesel Mechanical, Diesel Hydraulic, Diesel Electric, Alcohol and Gasoline Locomotives from 3 to 70 tons

Join the mine operators and engineers who act on facts—and buy on results—men who are in the habit of doing business with Pressed Steel Car Company.

In mines all over the world . . . under conditions that demand the best from every piece of equipment . . . Pressed Steel Car products have proved their worth. That's because Pressed Steel Car equipment is designed to do the job faster . . . is engineered to do the job better . . . is built to last longer. Specify Pressed Steel Car equipment and watch costs go down—and efficiency go up.

We'll be glad to help you select the right equipment for your particular job. Just send particulars to our Research Department. Our engineers will be glad to give you the benefit of their experience without cost or obligation.
Just write—Department J




Unistrut metal framing can be used as a support for power cables, as shown, and for practically every rack and shelving installation. Unistrut requires no hole drilling, no welding—is 100% adjustable and is 100% re-usable.

Steelcar

PSC

Products to Serve Industry . . . Farm . . . and Home Hydraulic Pumping Units • Precision Deep Well Plunger Pumps • Steel Sucker Rods • Engine Lathes • Aircraft Landing Gear Shock Struts • Precision Gears & Gear Mechanisms • Dairy Cans & Equipment • Self-Closing Receptacles • Permanent Cookware • Farm Holding Tanks • Storage Hoppers • Alloy Steel Containers • Oil Storage Tanks • Rendering and Softening Tanks • Agitators • Smoke Stacks • Dust Collectors Coal and Ash Hoppers • Lock Nuts & Bushings • Couplings & Connectors Fittings & Electrical Accessories • Unishelter Homes

PRESSED STEEL CAR CO., INC.

EXPORT DIVISION 25 Broad Street New York 4, N. Y.

Railway Freight Cars (Mainline) • Industrial Railway Cars for agriculture, mining, construction, factory and mill service • Permanent and portable Industrial Railway Track Equipment • Locomotives for mainline switching and all industrial railway service • Clay, Brick and Tile Machinery • Railway Inspection and Gang Cars • Weed Burners • Unistrut Metal Framing

1. Orinoco Mining Company's new ore and cargo handling dock on the Orinoco River, Venezuela. Composed of 3 units, this DeLong dock is 1,130 ft. long, 82 ft. wide, and 15 ft. deep.

DeLong AIRJACK TRANSFORMS SEA-GOING DOCK-BARGE INTO ORE AND CARGO PIER!

Cuts time, costs!

Field work is practically eliminated in dock construction, due to the development of the patented DeLong Airjack. This new technique of dock construction speeds installation, cuts costs.

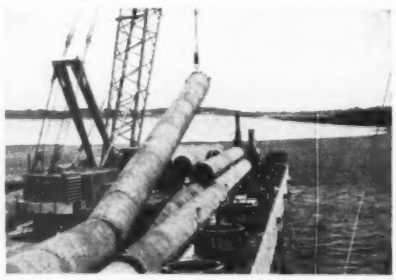
The DeLong Airjacks, which are the key to the whole transformation of barge to pier, enable the dock to "climb" the steel columns, or caissons, to required elevation. After the self-lifting operation, caissons are driven to refusal for permanent installations. Caissons are welded to deck and cut off flush; then filled with concrete or sand and tops closed with welded cover plate.

More than ½ million sq. ft. of the DeLong type of pier are in use or under construction in diversified locations that range from the Arctic to South America.

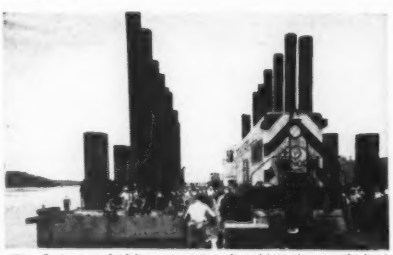
The DeLong Airjack can cut time and costs in the construction of offshore oil well drilling platforms, portable and permanent piers, and many other types of installations. A DeLong dock can be erected and, after having served its purpose, jacked back to water level and towed to a new location.

2. A week after arrival at Orinoco River site, first dock section 376 ft. long berths ship, and unloading begins. Two additional units make this pier 1,130 ft. long.

3. Loaded dock section, fabricated at an Orange, Texas yard, arriving at site on Orinoco River, after being towed across 3,000 miles of ocean. Dock carried caissons, crane, Airjacks, compressors, generators, other installation gear.



4. Crane placing 6 ft. diam., 100 ft. long steel caissons in wells fitted with Airjacks. Crane, Airjacks and other equipment were later transferred to second and third sections for erection purposes.



5. Caissons held in position by Airjacks until dock barge is jockeyed into final position. Caissons are then dropped to river bottom and DeLong Airjacks lift dock to final elevation. Control is so precise, height of dock can be regulated to 1/32 of an inch.

DeLong
Engineering & Construction Co.
29 BROADWAY, NEW YORK 6, N. Y.
Phone: HAnover 2-1275

WASHINGTON 5, D. C.	SEATTLE, WASH.	CARACAS, VENEZUELA	SAN FELIX, VENEZUELA
729–15th St., N. W.	32nd Floor, Smith Tower	Apartado 968	

India *(Continued)*

cutta or Dehri-on-Sone. Labor was plentiful but unskilled.

Final determination may be that the project is not feasible. But exploration is continuing and Indian mining officials still harbor hope that the operation may make India at least partially independent of sulphur imports.

IN THE PHILIPPINES

● **Atlas Consolidated Mining & Development Corp.** reports that work on the Toledo, Cebu, copper property has proven positive and probable ore reserves totalling 15-million tons of an average assay of 1.3% Cu and 0.015 oz of gold per ton.

So far only a small part of the property has been intensively explored and it is therefore thought possible that work in other sections may prove an additional 50-million to 100-million tons.

Atlas has signed a three-year contract with the Mitsubishi Metal Mining Co. for the sale of the mine's entire production of copper concentrates. Mitsubishi has agreed to supply $750,000 worth of equipment as down payment. Atlas is also negotiating with Japanese steel mills for the sale of iron ore from its Mati property. This has proven a positive ore reserve of 1,566,400 tons of an average content of better than 60% iron.

So far, 9,096 ft of diamond drilling has been completed at Toledo. Drifting and cross-cutting has reached 1,677 ft and produced 4,000 tons averaging 1.17% Cu, including ore from open-cut operations. It is loaded into 22-ton trucks with 2 cu yd shovels.

A milling plant of 4,000 tons daily capacity, believed to be the largest copper treatment plant in the "Far and Near East," is expected to be in operation late in 1954.

The Toledo mine, now being developed under the auspices of the Soriano combine, was for many years associated with Japanese copper interests. As early as 1930 the Japanese formed a company in which they held a 40% visible interest (the maximum allowed by Philippine laws). During the 1942-1945 occupation, Japanese engineers installed a mill assembled from equipment which had been stripped from American-owned gold mines. About 50,000 tons of ore assaying 2% to 4% Cu were blocked out during the Japanese occupation. At least 13,000 tons of ore were crushed in the mill.

In 1951 the Japanese interests were acquired from the custodian of enemy property by Mindanao Mother Lode Mines. Mindanao Mother Lode later let an option to A. Soriano & Co. to develop and operate the mine on a royalty basis. In July this year Atlas

Consolidated made an outright purchase of the entire property.

The Toledo copper mine is located in Sitio Lutopan within the municipality of Toledo in the middle western part of the island of Cebu. The existence of sulfide orebodies in similar basement areas about two miles east and three miles west of Lutopan suggests the possibility of an east-west striking mineral belt. There are surface indications which point to the possible occurrence of deeper-lying ore shoots.

Such indications are provided by the intense hydrothermal alteration in the andesite, especially in the vicinity of diorite bodies, and the relatively insignificant areas occupied by the diorite intrusives compared with the total area of basement rocks exposed, according to a report by the Bureau of Mines.

● **Philippine gold mining industry suffered another severe blow** when Atok-Big Wedge Mining Co. suspended operations indefinitely in November following a long period of unprofitable production.

The immediate cause was ascribed to insistence by the government on a slash in the amount deductible daily from miners' wages to pay for "fringe benefits." Grade of mill heads had been declining and had been barely sufficient to meet out-of-pocket costs before the shutdown, and ore reserves had been depleted.

Atok-Big Wedge was the first gold mine to be rehabilitated after the war and ranked second in importance in the Baguio area as a gold producer. In 1952 its output totaled 33,378 oz of gold.

Shut-down of Atok-Big Wedge following Mindanao Mother Lode, and United Paracale earlier in the year has reduced the number of producing mines to six lode and one dredge operation. In November total tonnage milled was 132,400, with the production valued at $1,144,000 at the statutory price but at $1,690,000 on the open market. The gold price in November averaged about 103 pesos an ounce. Surigao Consolidated milled the highest grade ore, 14,230 tons averaging $16 per ton at $35 gold. Closely following was San Mauricio with 9,557 tons averaging $15. For the entire six gold mines the average recovery was $8.50 per ton at the statutory price or $13 on the open market figure.

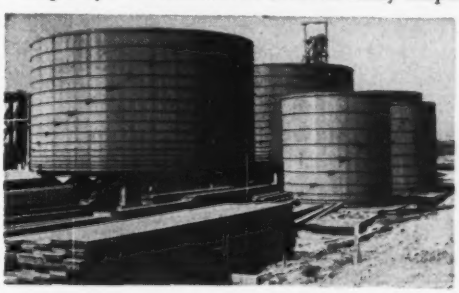
● **Progress is slow on the new railroad** connecting the Masenloc chromite deposits with tidewater. Surveys have been completed and culverts built but it is doubtful if the job will be finished before late 1954. The mine has tremendous reserves of milling grade ore but shipping ore is being depleted. The ratio of concentrates to shipping ore is about three to one. Milling capacity is being increased. Another heavy media plant is being built as well as Humphreys spirals which are being used successfully at Acoje Mining Company.

INDUSTRY NEWS IN BRIEF . . .

SANTA FE TANK & TOWER COMPANY SHOWS FLEXIBILITY OF WOOD TANKS FOR MINING OPERATIONS

Wood storage tanks have long served as standard equipment for the mining industry. And with the rapid progress of mining, the ever-efficient wood tank continues to play an increasingly important role.

The Santa Fe Tank & Tower Company, Los Angeles, has devoted no less than 50 years to this field. As one of the leading authorities in wood engineering, Santa Fe has succeeded in developing wood tanks to their *maximum* potential. They have multiplied the uses for wood tanks in mining operations by offering *flexibility* in sizes, shapes and field erection. Actually, the capacities of wood tanks are almost limitless . . . measuring, for example, from 50 gallons to almost 2 million gallons in capacity. These tanks are built in many shapes, according to customer requirements. The diameters likewise vary from 2 feet to as much as 120 feet, or even more. Santa Fe engineers emphasize that "there is almost no limit to what can be done with wood tank construction." They have also been found to be easily *dismantled*, and then *re-erected* in other localities.



Wood tanks are now universally accepted for almost all mining operations . . . gold, silver, copper, uranium, to mention a few. For the storage of water, acid solution, leaching plants and other mining operations, wood tanks are desirable for their resistance to corrosion. Serving almost any storage purpose, they have the ability to withstand constant use for many years. Maintenance costs are generally very low, particularly since painting is not required.

The installations shown here were designed and fabricated by the Santa Fe Tank and Tower Company. Additional information (Mining Bulletin M-45) is available by writing Santa Fe, 5401 S. Boyle Ave., Los Angeles 58, California. Engineering data is also available on Wood Pipe, Cooling Towers, Cylindrical Gas Scrubbers, and other industrial wood specialties. Santa Fe maintains branch offices in all principal cities.

STEEL

Prompt Shipment . . .

Our stocks of Certified Quality Steel are large and becoming more complete. Quick, dependable service is assured

Plates, Structurals, Bars, Sheets, Tubes, etc. . . . Carbon, Alloy and Stainless Steels . . .

RYERSON

Joseph T. Ryerson & Son, Inc. Plants: New York, Boston, Philadelphia, Detroit, Cincinnati, Cleveland, Pittsburgh, Buffalo, Chicago, Milwaukee, St. Louis, Los Angeles, San Francisco, Seattle, Spokane

Hauls more - Costs less to run

5 Ton High Type MONITOR

Height — 42" to 48" depending on battery capacity required. Also available in sizes 4 to 12-tons. Track gauge — 16" to 56½".

GREENSBURG STORAGE BATTERY LOCOMOTIVES

Greensburg Storage Battery Locomotives are custom-built for the job . . . each designed to meet your specific requirements. Built in single or double motor drives with drum or contactor type controllers. Dynamic braking also available. Because of advanced engineering design, Greensburg locomotives have proven themselves up to 20% more efficient and have given longer battery life than any other storage battery locomotive of equal weight and battery capacity. On job after job, you'll find Greensburg locomotives will haul more and cost less to operate.

Write today for details!

GREENSBURG MACHINE CO. 102 STANTON STREET GREENSBURG, PA.

Philippines *(Continued)*

● **Acoje is finally hitting its stride** after a long postwar rehabilitation program. At present the mine is producing 300 tons a day of 48-49% chromite concentrates, with a 2.3:1 chrome-iron ratio. The company is milling from 20 to 35% chrome ore and raises it to a high-grade chemical concentrate. Reserves of milling ore are ample. In November Acoje shipped 7,329 tons worth $220,000.

● **Lepanto Consolidated continues on its profitable course,** shipping concentrates in November valued at $721,000 which placed it far in the lead of all Philippine mines. The gold content in the copper ore now being milled has increased to 0.25 oz per ton.

● **Philippine Iron Mines are presently installing** a 400-ton heavy media plant which will treat the old dumps. Plans are made as well for a 300-ton dual beneficiation plant which will treat the high sulphur magnetite ores by magnetic separation. The hematite-magnetite mixed ores will go to a combination of washing, heavy media, jigs, and Humphrey spirals.

● **The Pan Pacific Science Congress** in Manila from Nov. 16-28 was highly successful. Discussions were held on the geology of the principal gold and base metal deposits of the Philippines. Two post-sessional field trips were made, to Baguio and Mountain Province mines, and to Paracale, Surigao, and other southern mining areas. Nestorio N. Lim, secretary-treasurer of the Philippine Chamber of Mines, arranged the geological symposium and later accompanied Dr. Sampson of Princeton University on an extensive examination trip to the Zambajes chromite area.

IN EUROPE

GERMANY

● **West German Society for Utilization of Plant Raw Materials** and the Liberian government have signed an agreement whereby Germans will aid the exploitation and utilization of raw materials in Liberia. The agreement, announced in Bonn, includes also an option for exploitation of mineral resources. Agreement runs for 80 years.

AUSTRIA

● **Preparations are being made** for opening up the ancient Roehrerbuehel silver and copper workings near Kitzbuehel in the Austrian Tyrol where geologists believe there is a rich deposit of copper. The mine should be ready for working in 1954. Main shaft is to be sunk to a depth of 500 metres.

● **Austrian aluminum smelting plant** at Ranshofen intends to increase aluminum output in 1954 to around 42,000 tons from an estimated 37,500 tons last year. Capacity of the plant is 50,000 tons annually, but it cannot be used to the full during the winter when hydro-electric power is in short supply.

Copper output is also to be expanded and the Brixlegg (Tyrol) plant is adding new electrolysis facilities which will bring its output of electrolytic copper to 10,500 tons annually from 9,000 tons at present.

● **Biggest Austrian magnesite company**, the Veitscher Magnesit Werke A. G., has announced that for the first time all facilities of the company are used to full capacity. Related to this is the rise in the production of sinter magnesite by 9% during 1952, as against the year before, and the production increase of magnesite stone by 15%. The sale of magnesite stone has increased by 20%, while the sale of sinter magnesite has decreased by 7%. In the field of export 87.5% of magnesite stone production was sold to foreign customers, as well as 76.8% of all sinter magnesite produced.

The healthy condition of this company has permitted a dividend of 4% and an extra dividend of an additional 8%.

IN SCANDINAVIA

SWEDEN

● **Sweden, said to be** the largest supplier of iron ore on the international market, is now setting the stage for a major expansion of iron ore output.

By 1955, Sweden plans to raise its annual production to about 19,055,400 tons, 40% higher than the 1950 production of 13,611,000 tons. Since 1950, when expansion goals were established, Sweden has been moving ahead steadily. 1951 production amounted to 15,383,000 tons; 1952 output (preliminary figure) rose to 16,951 tons.

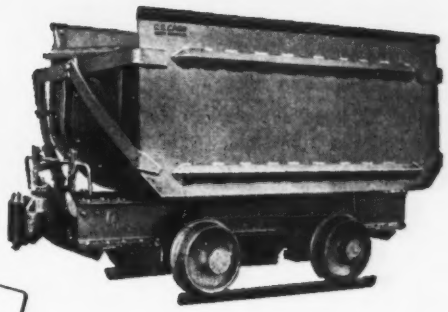
This expansion centers on ore fields in the northern section of Lapland, above the Artic Circle. Plans call for boosting production of this district 50% to 15-million tons annually.

To achieve such an increase, it is necessary not only to extend mining operations but also to effect a substantial boost in capacity of the ore railroad and of shipping ports, especially Narvik in Norway which always is ice-free. Some 75% of Lapland ores are shipped via Narvik.

Electric locomotives are being built which can haul a 50% greater load than those now in use. Loading machinery at ports also is being improved. It is estimated that in 1956 Narvik will boast an annual capacity of 15-million tons as against 9-million tons today.

Expansion is reined-in by the fact

Pick a winning Card!

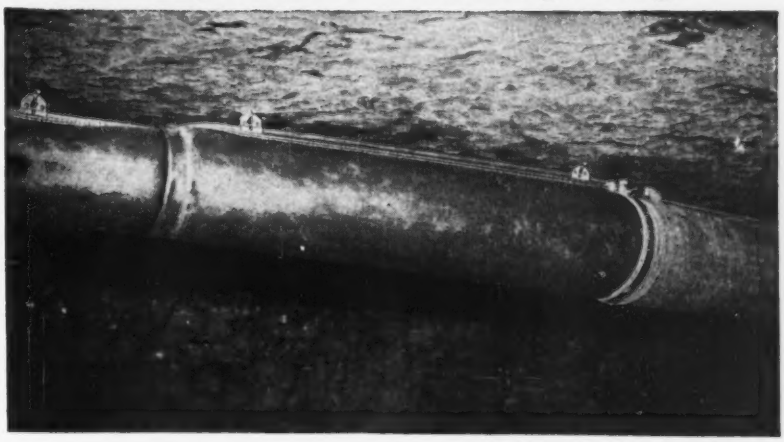


Every mine car built by *Card* is engineered to the mine conditions under which it will be used. You can pick the exact *Card* car to do the best job of cutting your ton-mile costs.

C.S. Card Iron Works Co.
2501 WEST 16TH AVE.
DENVER, COLORADO

SPECIFY

FLEXIPIPE® the quality ventilating tubing



Flexipipe is now available with Rope Seam Suspension *at no additional cost.* The newest, best, quickest suspension . . . eliminates special accessories and suspension wires . . . *all you need is a nail.* It equalizes strain on the tubing.

Flexipipe is efficient, serviceable, economical. Jute and heavy-duty grades available in a variety of lengths and diameters to meet your requirements.

Write for complete information and sample.

Bemis Bro. Bag Co.
408-E Pine St.,
St. Louis 2, Mo.

in the heart of the jungle

This trailer mounted Acker Teredo Diamond Core drill is hard at work locating and proving chrome ore bodies deep in the heart of a tropical jungle. The operators know from past experience that Acker builds rugged dependability into every drill—yet, essential elements are so light and compact that they can be carried by plane or mule-back.

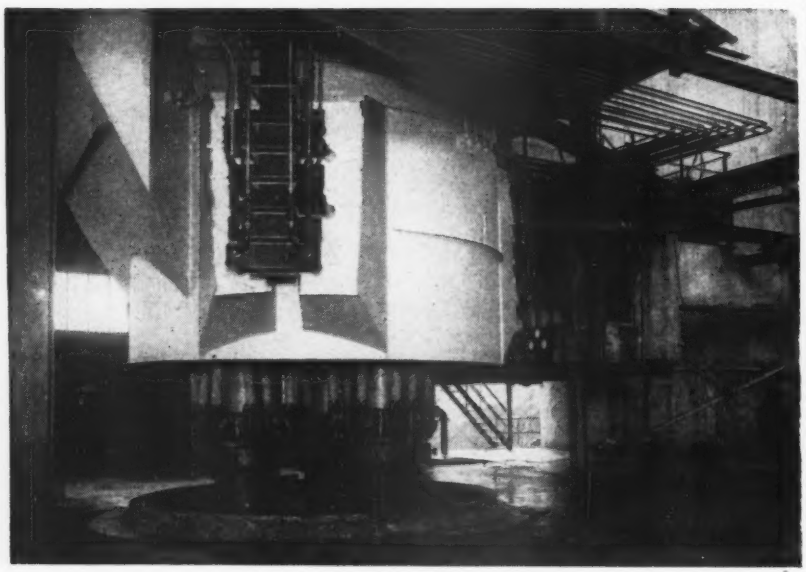
Want proof? Then write today for Teredo Bulletin 30, EMJ.

Acker Hydraulic Feed Teredo Trailer Mounted Diamond Core Drill drilling for chrome ore deposits deep in the Jungles.

ACKER DRILL CO., Inc.

725 W. Lackawanna Avenue
Scranton, Penna.

a comlete line of Diamond and Shot Core Drills, Drilling Accessories and Equipment



Elkem

ELECTRIC SMELTING FURNACES
The Soderberg Electrode System
Metallurgical plant design and erection

ELEKTROKEMISK A.S.

WRITE FOR CATALOG

101 PARK AVENUE, NEW YORK 17, NEW YORK
(HEAD OFFICE: OSLO, NORWAY)

Sweden *(Continued)*

that mining at Kiruna, leading ore center in Lapland, has reached a stage where open-cut workins are becoming exhausted and operations will have to be continued below ground.

Altogether, the program of modernization and expansion, including the changeover to underground mining at Kiruna, is estimated to require capital investments totaling 500-million kronor (about $100-million). The program is well under way; compared with 1950, Lapland ore shipments have increased by about 30%. It is estimated that by 1957, Sweden iron ore mines should be producing some 20-million tons, of which about 18 million tons will be available for export.

Iron ore deposits in northern Lapland were opened around 1900. Resources have been estimated at more than 2,000 million tons. One deposit at Kiruna, the Kiirunavaara Mountain, is one of the largest single bodies of ferrous ore in the world.

Lapland mines are operated by a private company, the Luossavaara-Kiirunavaara. Its preferred shares representing half the capital stock are owned by the government. The Grangesberg mining concern holds the common stock.

DENMARK

● **Shortage of capital may bring lead** prospecting in Greenland to a standstill, according to the Social Demokraten, a newspaper closely connected with the Danish Government. The greater part of the 15-million crowns so far provided is said to have been used up. The Scandinavian Mineral Society, which is carrying out the prospecting work, is expected to ask for a subsidy from the State of 12-million crowns and a guarantee for a similar sum.

The work is being carried out near Mestersvig in East Greenland. Results so far have been disappointing but the Canadian and other experts working in Greenland consider that

insufficient work has been done to form any decisive opinion.

NORWAY

● **Norwegian and Dutch scientists** at the Atomic Research Institute at Kjeller, near Oslo, are working on plans for construction of a 5,000 kw atomic generator.

● **Shipments of ore**—mainly iron ore—via the North Norwegian port of Narvik in October amounted to 650,000 tons, bringing the total for the first ten months of the year to 6,746,000. The total for the year is expected to be well below the original forecast of nine million tons.

IN AUSTRALIA

● **Mount Lyell Co.** announced in Melbourne that its open pit operations are to be expanded in 1954. It was added that completion of the firm's expansion program would require the obtaining in two or three years of extra concentration plant equipment to boost throughput capacity from 1.6-million tons per year to 2-million tons.

● **Australian gold production** for the first eight months of 1953 was a full 13% higher in volume than was the corresponding period of 1952 but it was still 33.4 per cent lower than the production in the corresponding period just before World War II. Increase is due mostly to increased production in Western Australia.

● **Experts claim that the virtual abolition** of benefits connected with Australian sales of gold in "free" markets will force several smaller gold producers to suspend operations unless the Government can produce assistance to the gold mining industry based on the Canadian scheme. The Federal Government's experts are at present discussing assistance to the copper industry and it is believed that it will mean the virtual acceptance by the Government of the principle to assist metal-producing industries in case of genuine need.

NEW ZEALAND

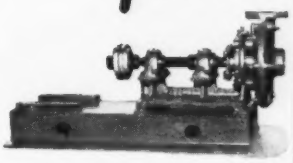
● **Prospecting operations for lead ore** are being actively carried out at Te Aroha by the Auckland Smelting Co. Ltd. and about 600 ft of cross-cutting was recently completed. The area contains promising mixed base metal sulphides.

● **Closing of the Martha mine** may mean the virtual cessation of silver mining in New Zealand. During 1952 the output was 51,016 oz compared with 133,291 oz in 1951.

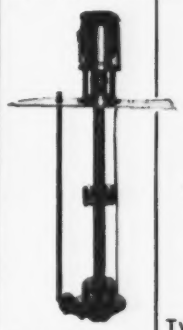
● **Decline in gold production** was also registered by the New Zealand in-

4 NEW NAGLE PUMPS
to lower your costs of handling Abrasive, Corrosive, Thick or Hot Liquids!

TYPE KC HORIZONTAL SHAFT PUMP



● Get the facts on this *new* series. Learn how they can cut *your* costs!



Type CWS-C vertical shaft pump (with submerged bearing)

Type CWO-C vertical shaft pump (with cantilever shaft—no submerged bearing)

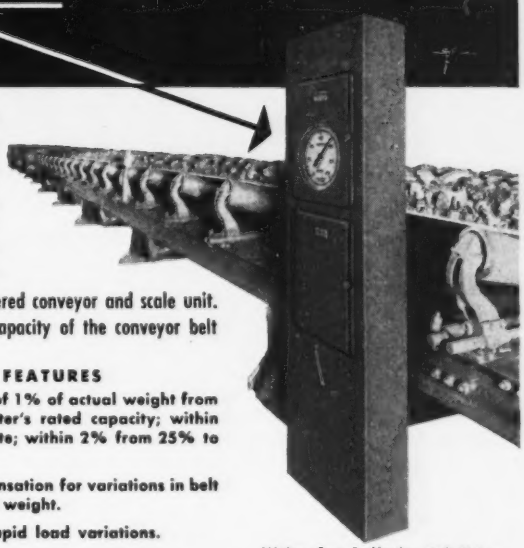
Type CWO-C vertical shaft pump with tailpipe

NAGLE PUMPS

NAGLE PUMPS, INC.
1239 CENTER AVENUE, CHICAGO HEIGHTS, ILLINOIS

PUMPS FOR ABRASIVE AND CORROSIVE APPLICATIONS

WEIGH IT ON THE GO!



Builders Conveyoflo—the modern conveyor meter — totalizes the weight of dry material passing over conveyor belts. Continuous, automatic, extremely accurate — Conveyoflo is installed right in your present conveyor, or can be furnished as a separate, self-powered conveyor and scale unit. Capacity is limited only by the capacity of the conveyor belt itself.

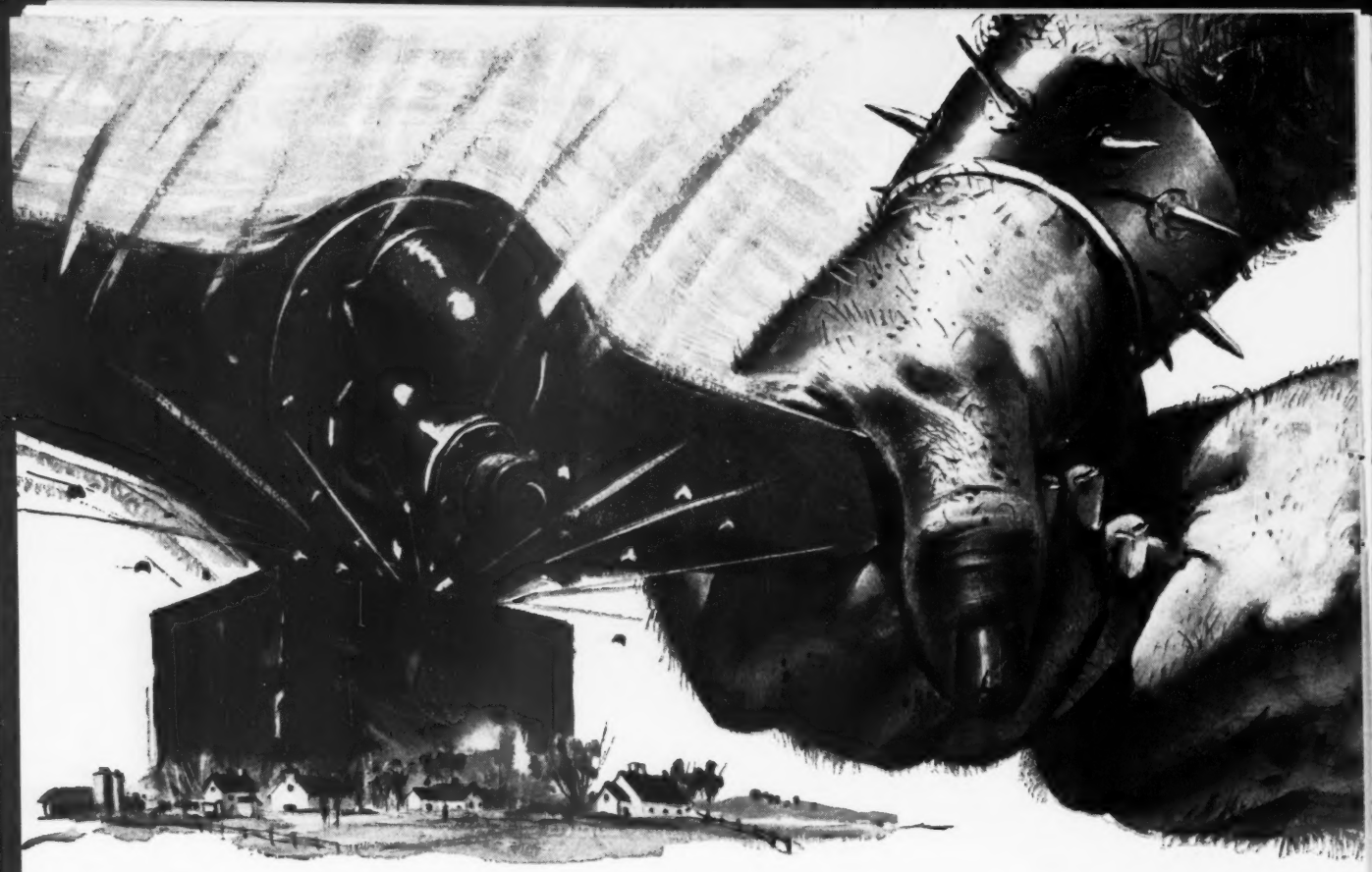
EXCLUSIVE FEATURES

- Accurate . . . within ± ½ of 1% of actual weight from maximum to 50% of meter's rated capacity; within 1% from 50% to 25% rate; within 2% from 25% to 10% of rated capacity.
- Automatic totalizer compensation for variations in belt speed and changes in belt weight.
- Responds accurately to rapid load variations.
- Paces auxiliary equipment (feeders, controllers, continuous blending processes, etc.) and operates secondary instruments.

Write for Bulletin 550-H4. Builders-Providence, Inc. (Division of B-I-F Industries, Inc.), 391 Harris Avenue, Providence 1, Rhode Island.

BUILDERS PROVIDENCE

PIONEERS IN METERS AND CONTROLS



We give truck axles a brutal

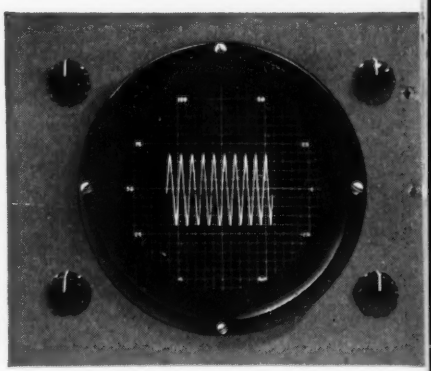
in the new Timken-Detroit indoor proving ground . . . and only

We torture them . . . shock-load, over-speed and jerk them . . . twist, strain and abuse them. We match every on-the-job hauling condition . . . then throw in a few devilish tricks of our own!

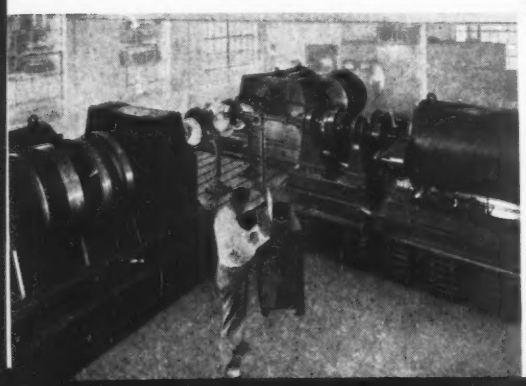
The result? You know for sure that *any* Timken-Detroit axle can take more abuse on the job it was built for than any other axle made!

To prove it, we moved a huge proving ground indoors. In one room we can simulate any hauling situation—our engineers can apply 50 years of experience to perfecting axles for modern trucks, buses and trailers, and measure performance with scientific precision.

This research pays off in longer truck life; less maintenance, repairs and downtime; lower operating costs. No wonder Timken-Detroit axles with Hypoid gearing rate "first" with wise truck owners!

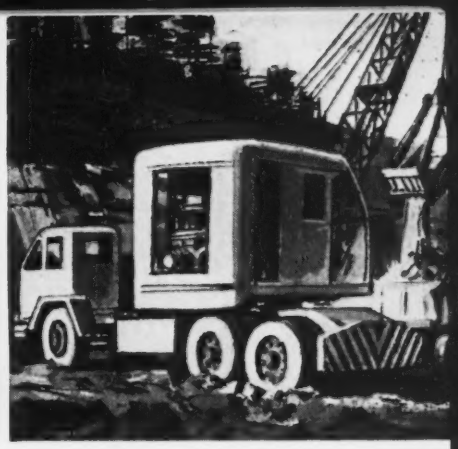


Whatever you haul . . . simulated service conditions show up electronically on a screen like this. For instance—a heavily loaded truck on a bumpy, twisting road—then on a level express highway or long grade. What happens to the axle and gearing is measured, charted with absolute scientific accuracy.



TDA proves axle quality and performance in this "Torture Chamber"

Here we simulate actual highway conditions . . . test quality and performance of axles under any hauling situation, such as duplicating the kinetic energy of 80,000 lbs., G.C.W., at 60 m.p.h. All tests are repeated hour after hour with an automatic cycling control.



You're hauling overburden . . . you want axles that can get you up, out and on the road—fast . . . with few shifts, low engine r.p.m. and skimpy gas consumption. You want to stay on the job . . . with little expense for maintenance or repairs plus long axle life. You want Timken-Detroit "Torture-Tested" axles with Hypoid gearing!

You're hauling out of the pit...loaded to capacity. It's all uphill . . . on soft, twisting makeshift roadway. It's a job for "man-sized" axles and gearing—units that can take rugged going—and not beat the engine and driver to pieces, nor run up costly repairs and shop time. A job for Timken-Detroit "Torture-Tested" axles with Hypoid gearing.

You're down to coal...working on any ground that'll stand still . . . you need quick mobility, power—and tonnage per day, too! You want a shovel combination that won't call it "quits" when going's rough. You want rugged gearing and axling . . . easy, low-cost maintenance, economical operation. You want Timken-Detroit "Torture-Tested" axles.

beating

Timken has it!

TIMKEN *Detroit* **AXLES**

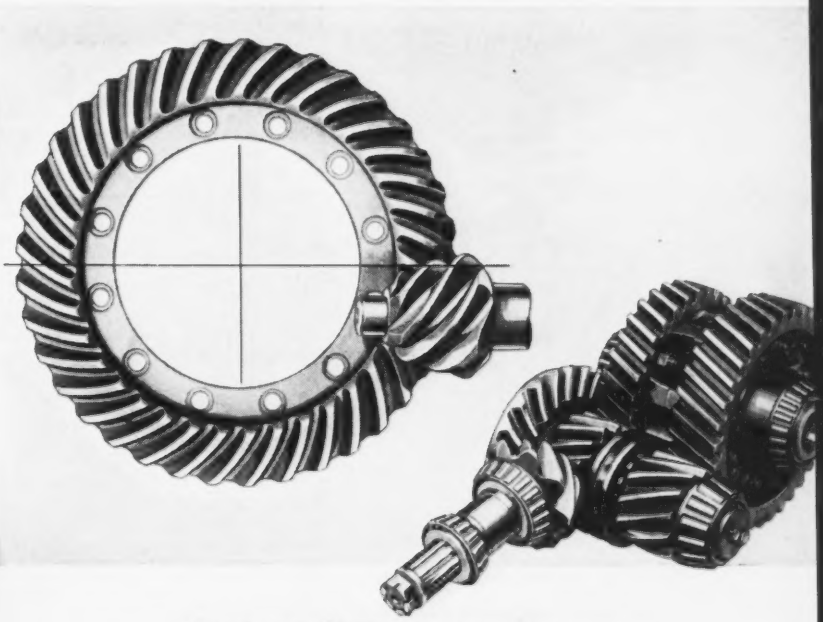
TIMKEN-DETROIT AXLE DIVISION
ROCKWELL SPRING AND AXLE COMPANY
DETROIT 32, MICHIGAN

The Accepted D A *Standard*

TRADE MARK REGISTERED

"TORTURE-TESTED"
to Save Money on the Job

WORLD'S LARGEST MANUFACTURERS OF AXLES FOR TRUCKS, BUSES AND TRAILERS



Next equipment you buy . . . specify Timken-Detroit Hypoid gearing

Hypoid gearing for truck axles was pioneered by Timken-Detroit.

Proved in billions of ton-miles of actual operation. Designed to give the slower gear ratios necessary for modern engines without loss of strength. Pinion is bigger, stronger . . . bearings are larger . . . more teeth in contact reducing loading per unit of contact area. Torque transmitting capacity increased to step up performance and rugged power.

Double the gear combinations

Get interchangeability, too! Only Timken-Detroit has Hypoid gearing in a complete "family" of 7 basic axle capacities—in the entire range of medium and heavy-duty requirements. This advanced-related design incorporates the same features of construction and interchangeability in single-speed; single-speed double-reduction; and two-speed double-reduction final drive units.

Plants at: Detroit, Michigan

Oshkosh, Wisconsin • Utica, New York • Ashtabula, Kenton and Newark, Ohio • New Castle, Pennsylvania

CUT HANDLING COSTS WITH...

C&D Slyver-Clad Batteries

Per-ton hauling costs are substantially reduced, when C & D *Slyver-Clad* Batteries supply the muscle. Reason: exclusive C & D Five-Fold plate insulation. *Sedimentation* is virtually eliminated —leaving extra space for longer, heavier plates. Yet there's no increase in over-all battery size!

Get *more* work for *less* cost Specify C & D—and see!

*T.M. Registered U.S. Pat. Off.

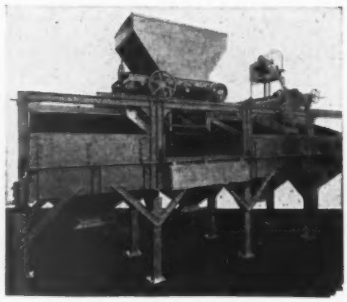
Send for details...

C&D BATTERIES, INC.
OF CONSHOHOCKEN, PA.
Gentlemen:
Please send me Mining Battery Bulletin ML-566.
NAME_____
FIRM_____
ADDRESS_____
CITY_____ STATE_____

C&D BATTERIES, INC.
of Conshohocken, Pa.
Manufacturers of Industrial Batteries since 1906
SALES AND SERVICE OFFICES IN PRINCIPAL CITIES FROM COAST TO COAST

Smelting on Site
with
MACE Furnaces
and
Sintering Hearths

Saves high transportation and treatment charges on your ores and concentrates.



Wire or write for new catalog.

Standard sizes 5 to 250 tons capacity. Working scale tests on ton lots or larger made at our Denver Smelter. Send us an analysis for preliminary report.

The Mace Company
FIRE CONCENTRATION METALLURGISTS
2763 BLAKE STREET, DENVER 5, COLO., U.S.A.

New Zealand *(Continued)*

dustry. In 1952 the production of gold was only 59,151 oz., the lowest recorded for any year since production attained significant proportions in 1861. Of the total productions, quartz mines accounted for 11,026 oz. (a decrease of 12,579 oz); dredges for 46,475 oz. (a decrease of 3,584 oz); and alluvial mines for 1,640 oz. The cessation of active mining at the Martha Mine at Waihi had the greatest influence on the output. The Martha Mine has produced in its lifetime 35,253,768 oz of gold and over $20-million was paid in dividends alone.

In the last 20 years of New Zealand gold production the best year was 1940 when 185,665 oz. of gold were mined. Since then the production was consistently dropping. At present even operators of dredges face an exhaustion of suitable ground.

NEW BOOKS

The Canadian Mineral Industry in 1951. Reviews by the staff of the Mines Branch of the Department of Mines and Technical Surveys, Canada. No. 841. Contains tables, list of contents. Pp. 170. Edmond Cloutier, Queen's Printer, Ottawa. Price 50c.

Weldon Bay Map-Area, Manitoba.

PRECISION RADIATION INSTRUMENTS
TAKES PRIDE IN
ANNOUNCING THE
"SCINTILLATOR"*

*Patent Pending

MODEL 111
Portable
Scintillation
Counter

DEALER INQUIRIES INVITED

• Made in the U. S. A. by Precision • 100 times the sensitivity of the best Geiger Counter • Suitable for aerial surveys or surveys from moving vehicles • Accuracy within 5% of ¾ full scale reading • Uses latest type RCA 6199 photomultiplier tube • Uses newest simplified circuit • Used by U. S. Geological Survey and the Atomic Energy Commission • Waterproof and tropicalized probe • Weight only 6¼ lbs. Probe 2 lbs. • Only two simple controls • Long battery life • Ranges .025, .05, .25, 1, 5 and 25 MR/HR.

Price complete only $495.00

Write for free catalog on the "Scintillator" and our complete line of Geiger Counters and metal locaters.

PRECISION RADIATION INSTRUMENTS
2235EJ South La Brea Ave., Los Angeles 16, Calif

Puts fresh air where you want it—Anywhere

Mine-Vent Tubing is made to go anywhere that fresh air is needed . . . with fittings available for every conceivable coursing dip, curve or bend. Yet, Mine-Vent is easy to move: Patented snap-on couplings and simplified hangers will save you countless hours of installation time. One man can hang 100 feet of Mine-Vent an hour with ease. with flexing.

Write us your ventilation needs . . . now.

AMERICAN BRATTICE CLOTH CORP., 220 Buffalo St., Warsaw, Indiana

"Canned" for your convenience

Durable, easy-to-handle fiber drums keeps MineVent in perfect condition until you need it

MineVent Tubing

New Books *(Continued)*

By J. Kalliokoski. Geological Survey of Canada, Memoir 270, Dept. of Mines and Technical Surveys. Pp. 80 plus maps, tables, figures, plates and index. Edmond Cloutier, Queen's Printer, Ottawa. Price 75c.

Batty Lake Map-Area, Manitoba. By D. S. Robertson. Geological Survey of Canada, Memoir 271, Dept. of Mines and Technical Surveys, Pp. 55 plus maps, tables, figures, plates and index. Edmond Cloutier, Queen's Printer, Ottawa. Price 75c.

The Geology of Geraldine Subdivision. By H. W. Wellman. New Zealand Geological Survey, Bulletin n.s. 50, 1953. Pp. 72 plus maps, tables, figures and index. R. E. Owen, Government Printer, Wellington. Price 15s paper cover; 17s 6d in quarter cloth.

Geology of the South-East Machakos Area. By R. G. Dodson. Geological Survey of Kenya, Report No. 25. Pp. 20 plus colored map, figures and tables. Government Printer, Nairobi. Price Sh. 6/50.

Geology of the Mombasa-Kwale Area. By P. V. Caswell, with a chapter on the Alkaline Igneous Complex at Jombo, by B. H. Baker. Geological Survey of Kenya, Report No. 24. Pp. 69 plus plates, tables, figures and maps (one in color). Government Printer, Nairobi. Price Sh. 17/50.

Annual Report of the Board of Regents of the Smithsonian Institution, 1952. Contains Operations, etc., of the institution for the year ended June 30, including two sections of interest to mining men: **The Ice Age in the North American Arctic,** by Richard F. Flint, which discusses the significance of the glacial and interglacial ages, evidence of glaciation, distribution and types of former glaciers, growth and disappearance of glaciers, repeated glacial ages, glacial lakes, the postglacial sea and rise of land, chronology and causes and the effect of glaciation on life; **The 1944 Eruption of Usu, in Hokkaido, Japan,** by Takeshi Minakami, Toshio Ishikawa and Kenzo Yagi, noting history, activity and development of the mountain. Contains plates, maps and figures, index. Pp. 454. For sale by the Supt. of Documents, U.S. Government Printing Office, Washington 25, D.C. Price $2.75. Reprints of the various articles in the report may be obtained, as long as the supply lasts, on request to the Division of Publications, Smithsonian Institute, Washington, 25.

Kyanite in Kenya, With an Account of Its Occurrence in Some Other Countries and a Discussion on Its Origin. By B. N. Temperly. Geological Survey of Kenya, Memoir No. 1. Pp. 87 plus maps, figures, tables, appendices. Government Printer, Nairobi. Price Sh. 7/50.

"pH at your fingertips..."

...nothing like it!

This revolutionary ANALYTICAL pH PROBE UNIT makes possible on-the-spot pH readings *anywhere*. No more trips to the laboratory, no supports, beakers holders or separate electrodes.

This PROBE UNIT has made possible a true pocket sized pH METER that simplifies pH determination and eliminates errors due to sampling techniques, turbidity, and presence of oxidizing or reducing agents.

No indicating solutions, measurement of sample or color matching are necessary.

Completely self-contained in waterproof ever-ready case with shoulder strap.

PRICE $125.00

Instrument size: 3x5-7/8 x 2-1/2 inches
Case size: 3-3/4 x 6-1/2 x 4-1/8 inches
Weight with accessories: 3 lbs.

Analytical Measurements, Inc.

2167

ANALYTICAL MEASUREMENTS, INC.
585 Main St., Chatham, N. J.

Please Send Full Information To:

Name.....
Company.....
Street.....
City.....Zone.....State.....

ENGINEERING AND MINING JOURNAL PRESENTS IN MAY

The E & MJ

In recognition of the tremendous importance of open cut mining in the world-wide metal and nonmetallic mining industry, the editors of ENGINEERING AND MINING JOURNAL are preparing a special section for the May issue which will tell

- **How efficient open pit operations are planned**
- **The most effective methods of operating an open pit**
- **What to consider in selecting equipment and supplies**

A convenient buyers' guide which will list the equipment and materials generally used in open pit mining . . . and the names and addresses of the companies who supply them.

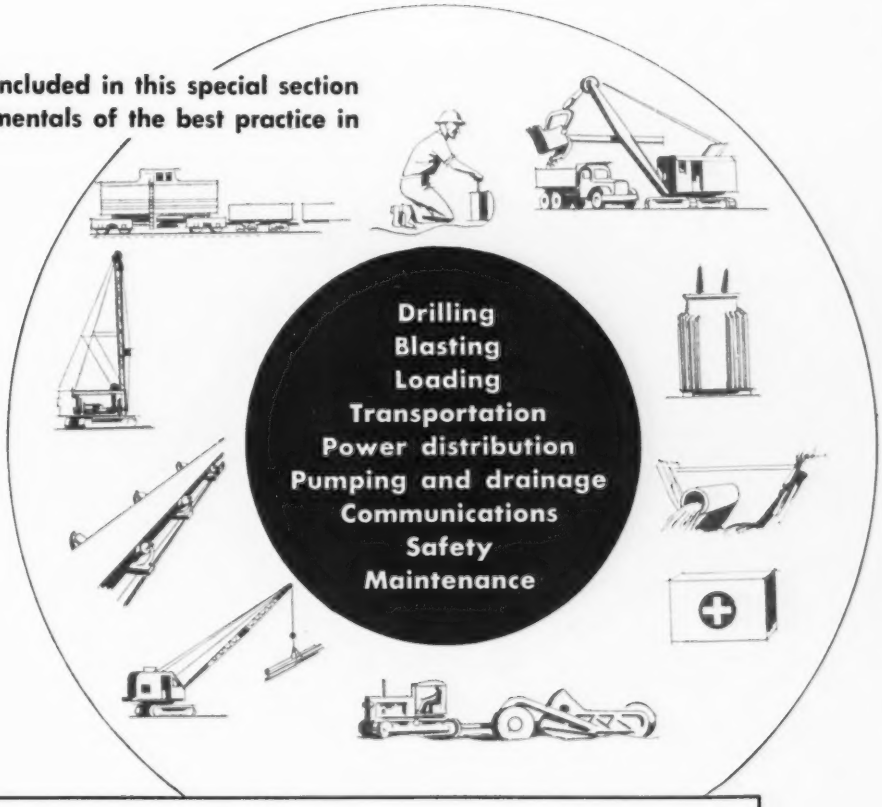
Advertisements showing and telling how specific equipment and supplies can help increase production at open pits or lower costs.

OPEN PIT MINES . . .

Produce 78% of the nation's iron ore.
Produce 80% of the country's copper ore.
Move more than 800,000,000 tons of ore and overburden annually.

Open Pit Mining Guidebook

Included in this special section will be the fundamentals of the best practice in



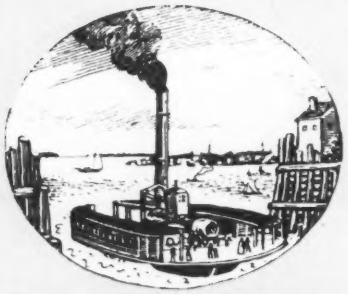
Important: The May issue of ENGINEERING AND MINING JOURNAL will contain all of the editorial departments and features which appear in every issue of ENGINEERING AND MINING JOURNAL.

Don't Miss the May Issue

A McGRAW-HILL PUBLICATION
330 WEST 42ND STREET, NEW YORK 36, N. Y.

ABP ABC

ENGINEERING AND MINING JOURNAL



WHEN THE BROOKLYN FERRY
LOOKED LIKE THIS...

TENNANT

WORLD TRADERS SINCE 1825

WAS TRADING
IN RAW MATERIALS
AND IS NOW TRADING IN

METALS & ORES
Antimony, Asbestos, Beryl, Brass, Cadmium, Chrome, Copper, Ferro Alloys, Ilmenite, Iron, Lead, Manganese, Monazite, Rutile, Tin, Titanium, Tungsten, Zinc, Zirconium.
AND
Chemicals, Chocolate, Cocoa, Essential Oils, Mining Machinery, Textiles, Vegetable Oils.

Yes, when the Brooklyn Ferry went from Old Ferry Road (now called Fulton Street) over to Peck's Slip on the New York side, the Tennant history in world trade began. It was 1825 and it took six minutes to make the crossing, while the fare was 4c. It was the time when Furman's Oyster House, in front of the ferry entrance, sold all the roast oysters you could eat at a sitting for 12½c.

Then, as now, Tennant imported materials vital to American industry and exported American manufactured goods for world consumption. The Tennant heritage is a tradition of *service* to producers and consumers.

C. TENNANT, SONS & CO.,
OF NEW YORK
100 Park Avenue, New York
244 California Street, San Francisco
TENNANT
IMPORTAÇÃO E EXPORTAÇÃO, LTDA.
4, Avenida Rio Branco, Rio de Janeiro, Brazil
Rua Seminario 41, São Paulo, Brazil
TENNANT (PERU) S.A.
611, Avenida Nicolas de Pierola
Dpto. 62, Lima

Cables: "TENNANTS" at all offices

New Books *(Continued)*

Geology of the Santa Rosa Lead Mine, Inyo County, Calif. By Edward M. Mackevett. Division of Mines, Dept. of Natural Resources, State of California, Special Report No. 34. Pp. 9 plus maps, tables, figures and plates. Obtainable at Division of Mines, Ferry Building, San Francisco, Calif. Price 50c.

Rosamond Uranium Prospect, Kern County, Calif. By George W. Walker. Division of Mines, Dept. of Natural Resources, State of California, Special Report No. 37. Pp. 8 plus figures and plates. Obtainable at Division of Mines, Ferry Building, San Francisco, Calif. Price 25c.

The following publications may be obtained free on request from the U.S. Bureau of Mines Publications Distribution Section, 4800 Forbes St., Pittsburgh, Pa.:

R.I. 5002. Sensitivity of Explosives to Initiation by Electrostatic Discharges. By F. W. Brown, D. J. Kusler and F. C. Gibson. Pp. 7 plus graphs and plates.

R.I. 4975. Properties of Carbon and Alloy Steels Made With Sponge Iron. By J. L. Morning and W. N. Stephens. Pp. 17 including tables.

R.I. 4999. Metallurgical Investigations of Southeastern Missouri Cobalt-Nickel Resources. By H. Kenworthy and K. K. Kershner. Pp. 37 plus figures, tables, plates and graphs.

I.C. 7669. Uranium-Mining Operations of the Utex Exploration Co. in the Big Indian District, San Juan County, Utah. By Charles A. Steen, George P. Dix, Jr., Scott W. Hazen, Jr., and Russell R. McLellan. Pp. 13 plus maps, plates, figures and tables.

The following reports may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., at the prices specified:

Geological Survey Bulletin 998-B. Some Zinc-Lead Deposits of the Wrangell District, Alaska. By H. R. Gault, D. L. Rossman, G. M. Flint, Jr., and R. G. Ray. Pp. 55 plus figures, plates, maps and index. Price not specified.

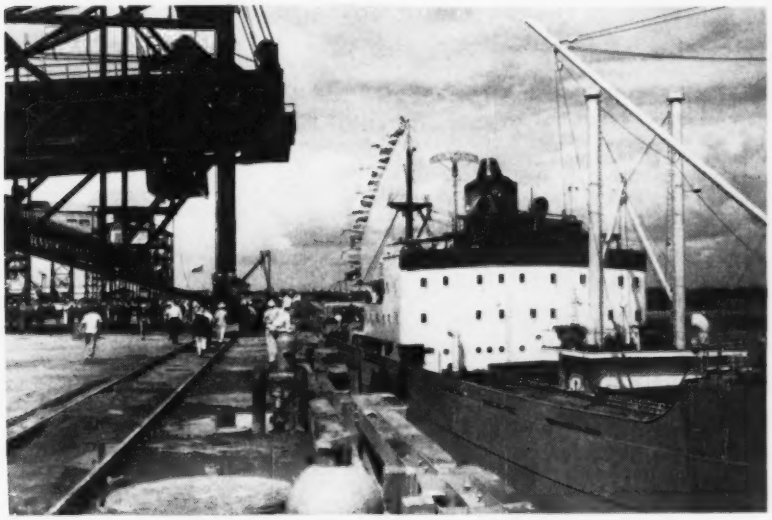
Geological Survey Bulletin 987. Fluorspar Deposits of the Eagle Mountains, Trans-Pecos, Texas. By Elliott Gillerman. Pp. 95 plus tables, plates and maps. Price not specified.

Geological Survey Bulletin 988-H. Uranium and Thorium Deposits in East-Central Idaho, Southwestern Montana. By Albert F. Trites, Jr. and Edwin W. Tooker. This report concerns work done on behalf of the U.S. Atomic Energy Commission. Pp. 208 plus tables, figures, maps and index. Price 35c.

ASCO
SAVES A DROWNING LADY
WE'VE HIT WATER!
THE SUMP PUMPS WON'T HOLD IT. WE'LL HAVE TO GROUT!
BUT WE DON'T HAVE THE BITS TO DO THE JOB!
WE'VE GOT TO HAVE MORE ASCO BITS IN TEN HOURS OR WE'LL LOSE THE LOWER PUMPING STATION IN OUR LADY Z! THE SUMP IS FILLED RIGHT NOW!
RUSH IT! YOU'VE GOT SIX HOURS TO SAVE A LADY'S LIFE!
ANTON Smit CO.
THEY JUST FLEW IN THESE ASCO BITS!
JUST IN TIME! LET'S GET CRACKING!
LADY Z
THAT WAS A CLOSE CALL BUT WE MADE IT, THANKS TO ASCO. YOU CAN ALWAYS DEPEND ON ANTON Smit FOR EXTRA SERVICE!
You can count on ASCO — not only in emergencies but for your everyday diamond drilling needs, too. ASCO means nearly a half-century of successful service to world wide mining. Send for free 16-page diamond drill bit book. Address Dept. E
ANTON Smit & Co., Inc.
333 West 52nd St • New York 19, N.Y.

Production Is Booming at Mount Isa

AUSTRALIA'S Mount Isa, one of the world's leading zinc-lead-silver-copper mines, produced more ore in 1953 than in any previous year, according to an announcement in Brisbane. Production achievement was listed at 850,952 tons, including 644,426 tons of silver-lead-zinc ore and 206,526 tons of copper ore. G. R. Fisher, chairman of Mount Isa Mines Ltd., said that present rate of production is exceeding 1-million tons per year. Grade of the 1953 ore milled was 7.4% lead, 6.4% zinc, 5.8 oz. silver and 3.56% copper. Silver-lead-zinc ore reserves were estimated at 9,879,800 tons; copper ore reserves at 3,911,250 tons. The mines are located in hot, semi-arid northwestern Queensland, nearly 1000 mi from Brisbane. Mineral deposits were discovered in 1923 but more than £A4-million was spent on exploration, development and installations before production got underway in 1931. Mount Isa Mines Ltd. assets were reported last year at £A15-million.



Historic Shipment Is First Link In A Long Chain

FIRST SHIPLOAD of iron ore from U. S. Steel's Cerro Bolivar left Puerto Ordaz, Venezuela, Jan. 9, carrying 6,000 tons of ore destined for the Fairless Works at Morrisville, Pa. Venezuelan President Marcos Perez Jiminez pushed a button and set into operation the overhead ore-loading conveyor (part of which is shown at left). Also on hand was Francis Thomas, president, Orinoco Mining Co., U. S. Steel subsidiary charged with the Venezuelan iron ore development. For a full discussion of the Cerro Bolivar operation, see *E&MJ*, December 1953, p. 92. The Cerro Bolivar iron ore deposit, 90 mi north of the docks, is one of the largest deposits in the world. U. S. Steel, which has invested more than $100-million there, plans 1954 shipments of 5-million tons, eventual annual shipments of 10-million tons. Ship is a Swedish vessel, the "Tosca". The ship docked at Philadelphia on January 19.

You Get All These:

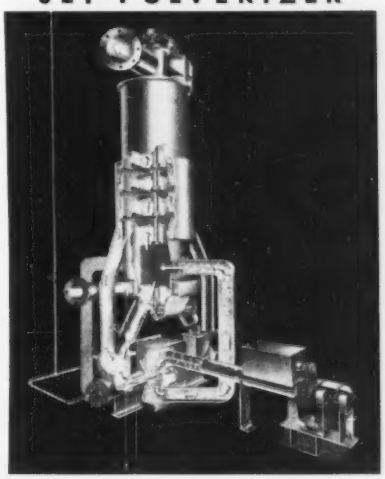
ACCURATE CONTROL OF FINENESS

VARIABLE PARTICLE SIZE DISTRIBUTION

FAST, CONTINUOUS PRODUCTION

LOW MAINTENANCE HIGH EFFICIENCY

WITH THE MAJAC JET PULVERIZER



When necessary the Majac Jet will pulverize to a fineness impossible by any other means. In addition, you can *control* that fineness accurately to any desired degree . . . or provide for various percentages of different micron sizes.

Operating by steam, gas or compressed air, the Jet keeps maintenance costs at a minimum. At the same time it provides fast, efficient pulverization of a wide range of materials. If pulverizing is on your program, find out about the Majac Jet.

Some materials which have been pulverized successfully by the Majac Jet:

Alumina	Graphite	Mica
Ceramic Frit	Gypsum	Perlite
Cement	Iron Ore	Silica Sand
Clays	Limestone	Talc

Pilot plant test grinding, and custom grinding on contract basis, also available.

Write for New Bulletin Containing Full Engineering Data

MAJAC INCORPORATED

23rd ST. and P.R.R. SHARPSBURG, PA.
(Pittsburgh District)

Letters *(Continued)*

Every discovery of a new natural resource within the U. S. creates a new source of revenue and employment . . . and new markets . . . (ali) ammunition in the battle to preserve our national economy.

If I were Secretary McKay, . . . I would direct my policy by assaying each decision on its merits (toward) preserving our national economy as well as "maintain at least a significant production of all those mineral raw materials needed by this country's industries."

GRANVILLE S. BORDEN
San Francisco, Calif.

Mining Rights

SIR:

(I should like to correct an item) on p 134 of *E&MJ* for November 1953 under the head. . Alaska. . (which began). . "Canadians have the same rights as Americans under Alaska mining laws, according to a legal opinion submitted by Attorney-General J. Gerald Williams to mining commissioner Phil Hodsworth."

The opinion (noted in the item) referred to section 13 of the act of Congress of May 14, 1898, . . . which extends to native-born citizens of the Dominion of Canada "the same mining rights and privileges accorded to citizens of the United States in British Columbia and the former Northwest Territory by the laws of the Dominion of Canada or the local laws, rules and regulations; but no greater rights shall thus be accorded than citizens of the United States or persons who have declared their intention to become such may enjoy in Alaska,***" and held that Canadian citizens "must be accorded mining rights in Alaska commensurate with those they may enjoy in British Columbia" but no greater rights than American citizens enjoy in Alaska.

Section 13 . . has never been, and is not now operative because the pertinent Canadian and Provincial mining laws, on the one hand, and the United States mining laws, on the other, are not conformable. . . . It is not possible to accord Canadian citizens "*the same mining rights and privileges*" accorded to U. S. citizens.

The above conclusion accords with the Department's construction of the law on June 8, 1898, shortly after its enactment, which . . . concluded that . . . "this section is inoperative."

EDWARD WOOZLEY, *Director*
Bureau of Land Management

Voting is The Root

SIR:

I read Mr. Herres' and Mr. Schmitt's arguments (Two Points of View on Tariffs, p. 78, November 1953). In my opinion, arguments on this question are a waste of time and energy, for no matter how fair a plan . . . it will not be adopted. The plan adopted will be the one favored by those who control the majority of votes . . . in the long run not the best for the nation as a whole.

Our problem is a voting problem. (The election of lawmakers, judges and executives) is due to the influence of those who control the majority of votes. As Mr. Schmitt says, "Self-interest dominates."

. . . To do something about . . . tariffs, (we) should study . . . voting. According to John Adams, "The question of voting is the question of questions, beside which all other procedure dwindles into insignificance."

WILLIAM CROCKER
Prescott, Ariz.

The Bureau in Business?

SIR:

In regard to your September editorial "The Bureau and Politics—II", if I may reply to your request for an explanation of why the present administration has removed a large number of top jobs in the U.S. Bureau of Mines from the status of Civil Service, I shall be pleased.

In my opinion, the title of your editorial should be "The Bureau in Business", not Politics. Civil Service has ensconced a group of men in the USBM who indirectly dictate the pol-

- Less weight—less fatigue.
- Approximately 1/3 the weight of conventional steel wrench.
- Special drop forged, heat treated, high tensile aluminum alloy.
- Rustproof—lasts longer.
- Chuck Wrench, Pull Wrench and Valve Key combined.
- Centre hole or side slotted type for 1" steels.
- Side slotted type for 7/8" steels.
- Other types available on request.
- Write for information.

Hayes

HAYES STEEL PRODUCTS LIMITED
MERRITTON, ONTARIO
CANADA

Detachable Drill Bits—Grinding Balls—Mining Equipment
Tranmission, Pole Line, Marine & Industrial Hardware
Universal Joints—Front & Rear Axles—Clutches
Forgings—Stampings—Machining

Have you a dust recovery problem?

Bring it to
WESTERN PRECIPITATION

... The Only Organization With Years Of "Know-How" In BOTH *Electrical* And *Mechanical* Recovery Methods!

If you have any kind of a suspension-recovery problem—whether dust, fly ash, fume, fog or mists—it will pay you to bring it to the leading organization in the field ... WESTERN PRECIPITATION CORPORATION. Western Precipitation not only pioneered, over 44 years ago, the first commercial application of the now-famous COTTRELL Electrical Precipitators, but also has been a leader for many years in the *mechanical* recovery field with its widely-accepted MULTICLONE Collectors.

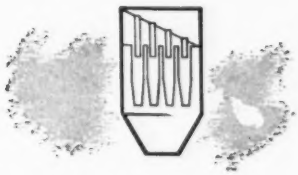
Result:

Western Precipitation is unsurpassed in the all-important factor of "know-how" in BOTH the electrical and mechanical fields ... knows from years of first-hand experience whether your particular problem can best be solved by mechanical or electrical methods—*or by a combination of the two* ... can give you a direct and unbiased recommendation on the matter ... and then can provide the complete installation under *one* responsibility, *one* overall performance guarantee, even where Combination Multiclone-Precipitator (CMP) installations are made!

Western Precipitation products and services include ...

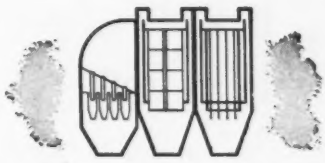
COTTRELL
Electrical Precipitators

... the most efficient recovery equipment for high recovery, long life, low maintenance on practically any type of suspensions, wet or dry. COTTRELLS can be designed to handle a few c.f.m. —or millions—with equal ease, and at virtually any operating temperature. Recovery efficiencies closely approach 100% recovery, if desired, with very low draft loss, minimum power costs and negligible labor costs. *By all standards, Western Precipitation* COTTRELLS *give highest recovery at lowest cost per-year-of-service!*



MULTICLONE
Mechanical Collectors

... the most efficient, most compact, most trouble-free mechanical equipment for recovering suspensions from gases. Because of their unique small-tube design, MULTICLONES are unsurpassed in mechanical recovery efficiencies—require less space, less maintenance, and are far simpler to install. No filters or screens to replace, nothing to burn or cause fire hazards, no high speed moving parts to repair or replace. These and many other advantages make MULTICLONE Collectors the logical choice on installations where mechanical recovery is selected.

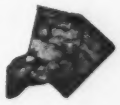


CMP UNITS
(Combination Multiclone-Precipitator)

... combine, in *one* compact installation, *both* mechanical and electrical recovery principles so that maximum benefit is obtained from the advantages inherent in each method. The MULTICLONE section centrifugally removes the larger and heavier suspensions (down to a few microns in diameter) ... and the COTTRELL section then electrically removes the very small particles remaining in the gases. Thus, the bulk of the recovery is obtained with relatively low-cost equipment, and the final clean-up is obtained with equipment having unusually high recovery efficiency—approaching theoretically perfect, if desired.

The recovery of suspensions from gases is a highly exact science and every problem is different. Some require mechanical methods—others electrical methods—still others a combination of mechanical and electrical methods in proper balance to meet the individual requirements of each application. No matter what your problem, remember that only Western Precipitation has had years of field experience in BOTH mechanical and electrical methods!

Send for descriptive literature!



Let our experienced engineers study your recovery requirements and make an unbiased recommendation on the equipment best suited to your particular problem. A wire, phone call or letter to our nearest office places this unique "know-how" at your service, without obligation.

WESTERN Precipitation CORPORATION

DESIGNERS AND MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

Main Offices: 1012 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA
CHRYSLER BLDG., NEW YORK 17 • 1 N. la SALLE ST. BLDG., CHICAGO 2
1429 PEACHTREE ST. N.E., ATLANTA 5 • HOBART BLDG., SAN FRANCISCO 4
PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

MULTICLONE—T.M. Reg.

Letters *(Continued)*

icy of every coal mining operation in the U.S.A. Under the aegis of safety, they must approve every piece of electrical coal mining machinery, and none other can be used. There are about five manufacturers who get 99 and 44/100% of this $100-million business each year. Why?

Because only Bureau-approved equipment can be used. Talk about restraint of trade!

Is there anyone naive enough to think that only about five companies are capable of manufacturing this equipment? Here is a monopoly that, through the instrumentality of the Bureau of Mines Safety Division, in my opinion is able to violate the anti-trust laws.

Your editorial is the first news that I have of the present administration's intention. My comment would be that it looks like a good way to cut the price of coal production, and if this is a "grave mistake" of (the Eisenhower) administration, let us have more of them.

All of the top executives in the USBM should resign with a change in administration, going back to the Civil Service status they did not have (during the period when they directed the Bureau).

Then, all but the Director and Assistant Director would go into a personnel pool in the Bureau, from which the new administration could pick its executives who would again "take leave" from their CS status (unless they were retired, in which case they would automatically go back to Civil Service in the Bureau).

JOSEPH P. RUTH
The Ruth Co.
Denver, Colo.

In a Stope, Darkly

SIR:

Congratulations on your editorial ("Let's Liquidate the Individual") in the December 1953 *E&MJ*. You have hit a lot of nails on the head and since you deal with a group of hardheaded mining men (who are) trapped by social planners in a dark stope, you could light the way by more of the same type of clear thinking.

LEE E. TUCKER
Phoenix, Ariz.

Alaskan Platinum

SIR:

I believe that I can claim to be the first to discover paying amounts of the platinum groups in veins or dikes in Alaska, and of extracting the same on a commercial basis of less than a dollar a ton. Heretofore, it was believed that they were to be found in placer deposits only.

At the Fern mine, in the Talkeetna Mountains, in 1923 I installed a Deister table and a 40-ton cyanide mill to improve gold recovery and cut tailings loss. On smelting the zinc precipitates I encountered trouble due to the great amount of platinum (containing 29% iridium) in the precipitate and the impossibility of fusing it in our furnace burner. I took samples of the slag and recently came across them, which re-awakened my interest.

REGINALD JOHN MELLOR
Idaho City, Ida.

More of the Same?

SIR:

Congratulations on your publication of the splendid article by Mr. William P. Shea (What Price Lead, 1953-1975? December 1953). This sort of information should be of great benefit to producers, consumers, government officials and everyone else connected with the metal industry.

Let's have more of the same on copper and zinc.

E. L. OHLE, *Geologist*
Bonne Terre, Mo.

ED: *More of the same may be found in the main editorial section of this issue of E&MJ. Articles on copper and zinc, which cover almost the same aspects of the subject, are by H. H. Wanders and Charles R. Ince. Both authors are long-time students of metals economics.*

THE "WHAT" Nearly forty steel mills, here and abroad, have purchased Differential Air Dump cars in capacities ranging from 30 to 60 cubic yards (level load).

THE "HOW" Massive air cylinders on both sides power the two-way, 50° dumping action. Wide spacing of fulcrums contributes to riding stability. No locking mechanism — no accidental dumping.

Down-folding doors chute the load a greater distance from track. Positive door return when car is righted. Overall ruggedness and simplicity of design mean minimum maintenance.

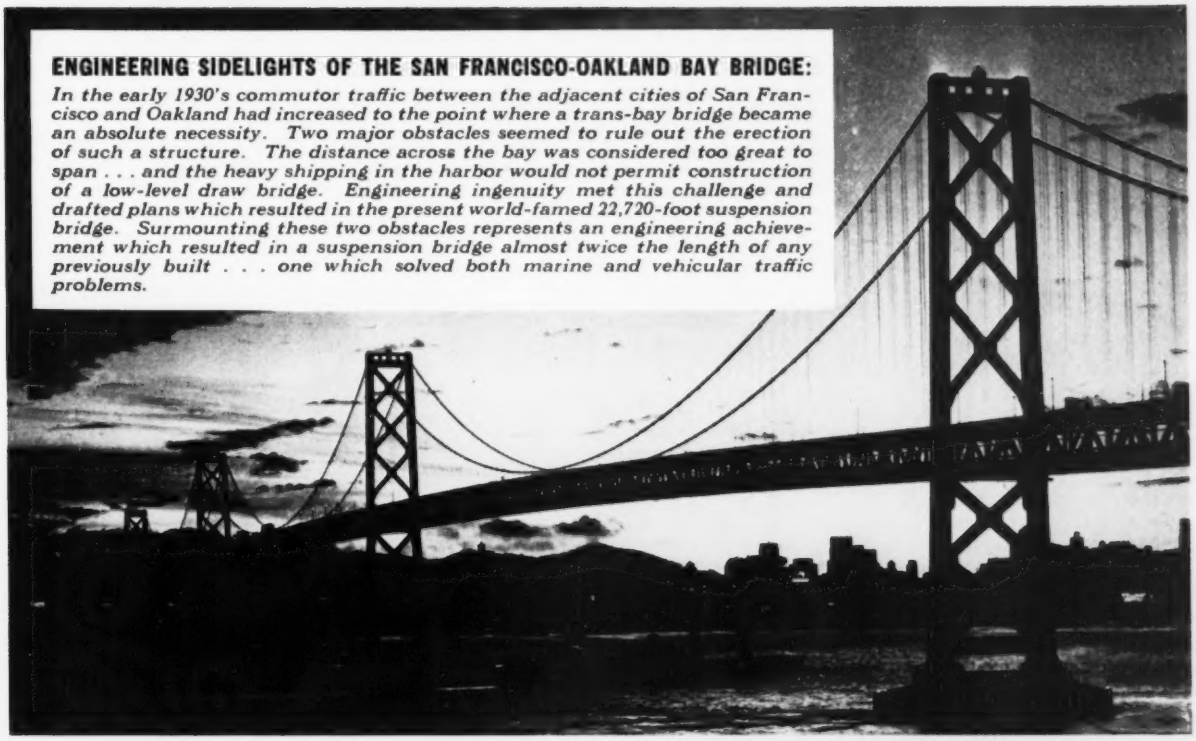
THE "WHY" It all adds up to a "higher ratio of payload to dead weight," superior performance — and ultimately to a prettier picture on the operating statement. That's "why" more and more steel mills have put Differential cars on their "earn-roll."

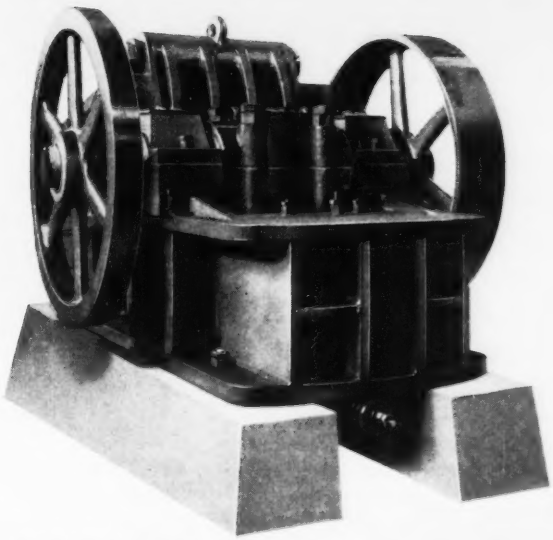
Other Differential Products: **Locomotives, Mine Cars, Mine Supply Cars, Rock Larries, Mantrip Cars, Rotary Dumpers and other dumping devices, and Complete Haulage Systems.**

SINCE 1915—PIONEERS IN HAULAGE EQUIPMENT

ENGINEERING SIDELIGHTS OF THE SAN FRANCISCO-OAKLAND BAY BRIDGE:

In the early 1930's commutor traffic between the adjacent cities of San Francisco and Oakland had increased to the point where a trans-bay bridge became an absolute necessity. Two major obstacles seemed to rule out the erection of such a structure. The distance across the bay was considered too great to span . . . and the heavy shipping in the harbor would not permit construction of a low-level draw bridge. Engineering ingenuity met this challenge and drafted plans which resulted in the present world-famed 22,720-foot suspension bridge. Surmounting these two obstacles represents an engineering achievement which resulted in a suspension bridge almost twice the length of any previously built . . . one which solved both marine and vehicular traffic problems.





Traylor Type H and HB Crushers are available in 15 sizes with feed openings from 8" x 12" to 56" x 72".

For Complete Information on all the outstanding features of Traylor Type H and HB Jaw Crushers, send for your free copy of bulletin 4105.

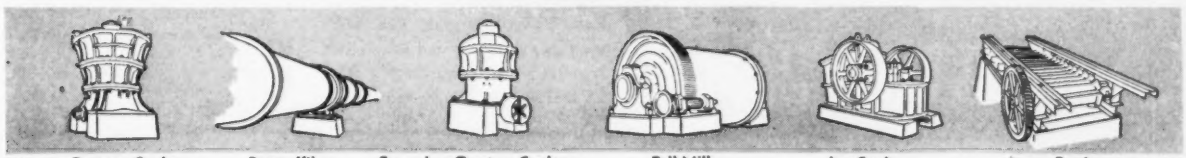
Traylor Engineering Achievements

Help You Two Ways in the Production of Aggregate

If yours is an aggregate production problem, Traylor's original curved jaw plates and swing jaw suspension can help you in two ways. With curved jaw plates, a finer product and greater capacity is assured at no increase in power requirements. In fact, Traylor Type H and HB Jaw Crushers require less power per ton of rock crushed than any other crusher, size for size. Traylor's patented method of Swing Jaw suspension, with shaft fixed in the sides of the frame, causes less strain on the crusher. This considerably reduces down-time and maintenance costs.

Traylor

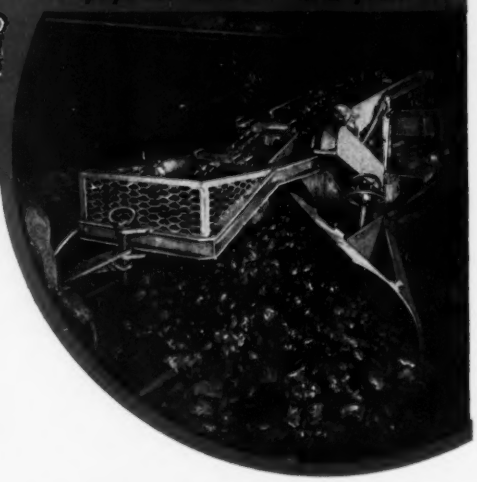
TRAYLOR ENGINEERING & MFG. CO.
612 MILL ST., ALLENTOWN, PA.
SALES OFFICES: New York • Chicago • San Francisco
CANADIAN MFRS: Canadian Vickers, Ltd., Montreal, P. Q.



Primary Gyratory Crushers | Rotary Kilns | Secondary Gyratory Crushers | Ball Mills | Jaw Crushers | Apron Feeders

Almost unbelievable Savings

"Canton" Track Cleaner pays for itself — in a year.



Tracks Cleaned at a Profit

Today, track cleaning is not a costly headache . . . it is a profitable operation. No track workers to get hurt. Clean tracks once thoroughly with the Canton Track Cleaner, then subsequent cleanings yield good coal. Load cars higher, haul more tonnage. Reclaim spillage mechanically. Write us for name of nearest mine where you can make inspection.

Performance Records . . .

893 three-ton cars, on time and one-half, were loaded with machine at a cost of $.462 per ton. Hand loading (estimating five 3-ton cars per man per shift) would cost $1.31 per ton. Total cost at $19.575 per shift for 893 cars with machines — $1237.70. Same number of cars, hand loading, would cost — $3509.49. Would the saving of $2271.79 have any effect on your cost per ton of coal? Another company loaded 887 tons at a cost of $.465 per ton cleaning 27860 ft. of track at $.015 per foot. (Names on request.)

Write for complete data. Please use street and zone numbers.

Write us what your track cleaning costs are and how many miles of track you clean, and we will show you how much extra profit you can make with a "Canton" Track Cleaner, after it has paid for itself.

American Mine Door Company

1039 Dueber Ave. • • Canton 6, Ohio

Mechanical Track Cleaners • Automatic Doors • Distributors • Car Transfers • Automatic Switch Throw

Cable Sallings and Yokes

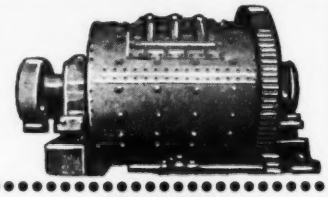
STRAUB

HAS RIB-CONE MILLS FOR ALL GRINDING OPERATIONS

More than 100 sizes and types of ball mills. 40 years of experience in supplying every conceivable grinding requirement is at your disposal in the form of engineering counsel. *An inquiry to our engineering department will bring a prompt reply.*

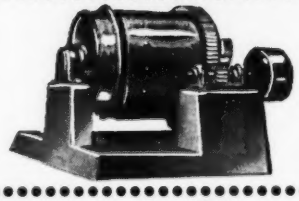
SECTIONALIZED MILL

Completely assembled in our shop, then marked and knocked down for shipping "Anywhere a Mule Can Go."



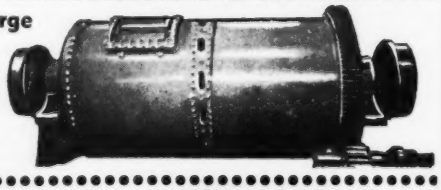
SCREENING MILL

Most economical type. Particularly suited to amalgamating and concentrating classes of ores. Capacity from 2 to 95 tons per 24 hours.



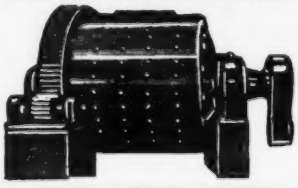
Peripheral Discharge MILL

Particularly suitable for producing a granular product. Designed for controlled grinding of tungsten and similar ores where sliming must be eliminated.



LOW PULP LINE MILL

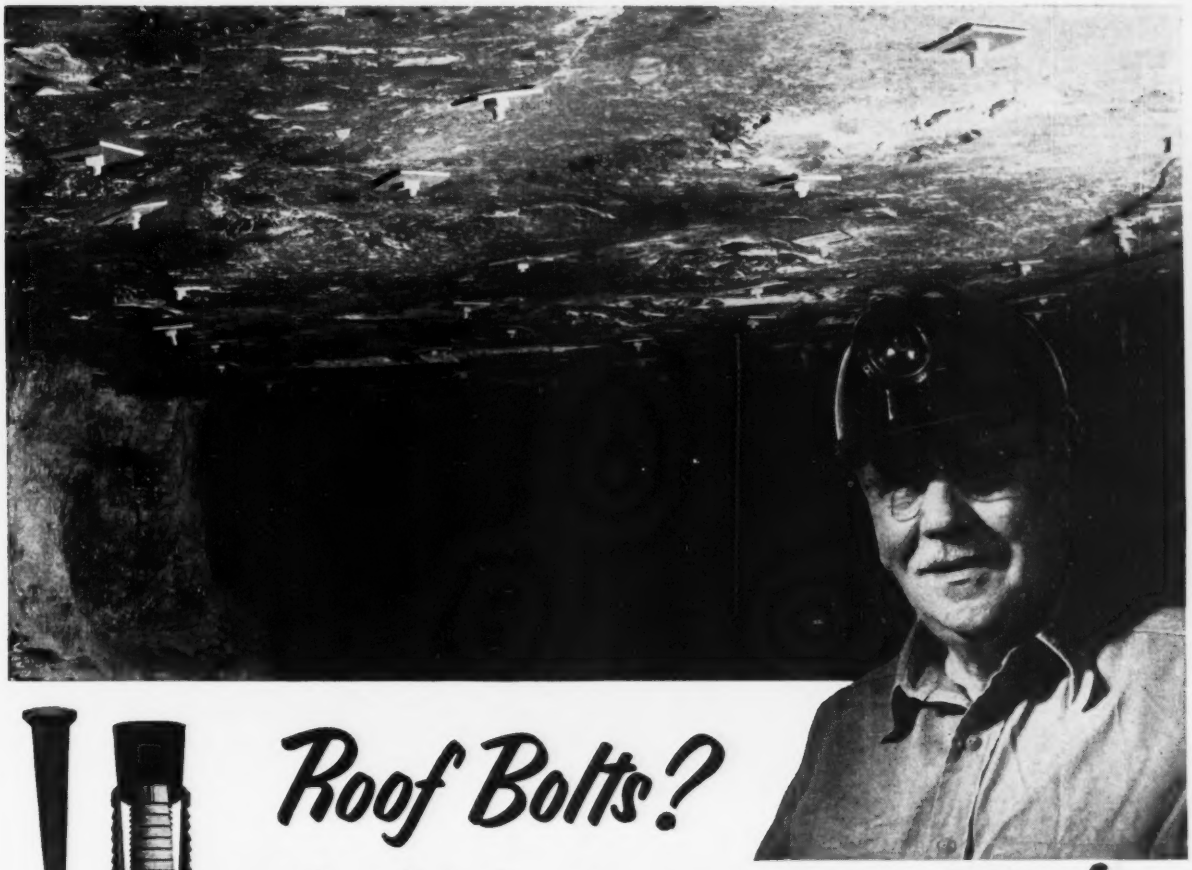
One of the new Champion Series. Available in low pulp line, plain overflow, screening and convertible types with capacities ranging from 25 to 250 tons per 24 hours.

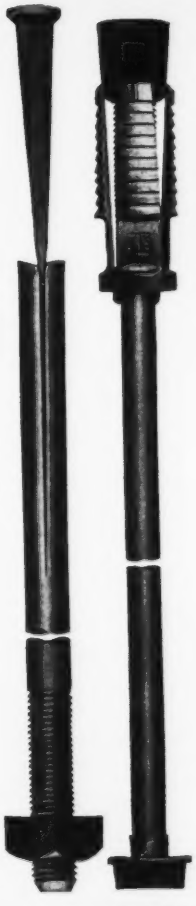


STRAUB MFG. CO.

622 CHESTNUT STREET • OAKLAND 20, CALIF.

★ More than 100 Sizes and Types of RIB-CONE Ball Mills.





Roof Bolts? Wouldn't be without 'em!

"Sure, I was kind of cool toward roof bolts at first. After all, I've worked in this mine for years, and was used to other types of roof supports. But now that I've had time to watch roof bolts in use, and realize how they reduce the accident rate, and increase production, too—well, I just wouldn't be without 'em!"

• • • • •

Roof bolts improve safety and increase production. In addition, they make possible better ventilation, greater clearances, wider mine openings and faster haulage. And they eliminate the need for space-consuming supports.

Bethlehem makes the two types of roof bolts shown here. Each is available in various lengths, and can be installed vertically or at an angle. Like full information? Write to us at Bethlehem, Pa.

SLOTTED ROOF BOLT—A 1-in. bolt, for use in 1¼-in. hole. Has centered, forged slot, 6 in. long, which receives steel wedge. No metal is removed by slotting. Opposite end of bolt has 5 in. of rolled threads. When bolt is driven, the wedge is forced into slot, expanding bolt-end. Truncated-cone point prevents thread damage. Fitted with American Standard Regular Square Nut.

SQUARE HEAD ROOF BOLT—A ¾-in. bolt, for use in 1⅜-in. hole. Furnished with expansion shell. Bolt has rolled threads, unchamfered head. Pressed ears on shank support shell during anchoring. When bolt is tightened, shell expands, locks against sides of hole.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

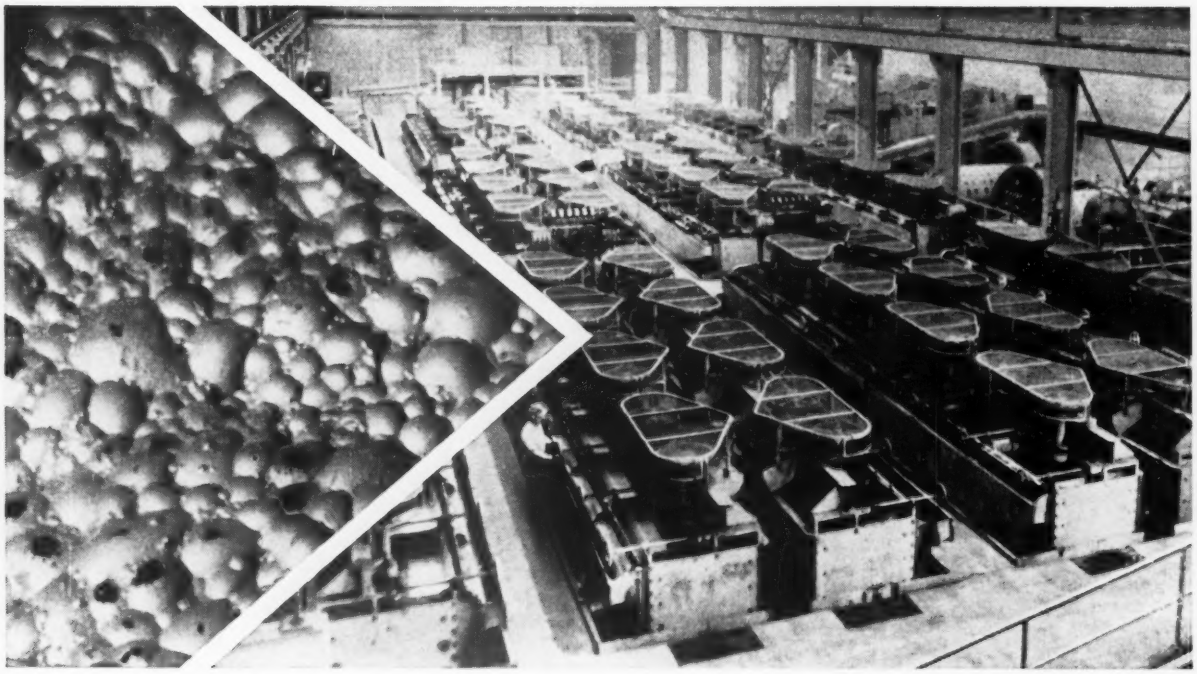
BETHLEHEM MINE ROOF BOLTS

BETHLEHEM STEEL

DOW

DOWFROTH 250

BUILDS BETTER FROTH AT LOWER COST



This quality frothing agent by Dow raises concentrate grade and increases recovery —with less frother consumption!

Dowfroth® 250 in many mills today is producing improved metallurgy with as little as one-fourth the consumption of previous frothers used. These are not just laboratory tests, but full-scale mill results. This could mean increased profits and lower operating costs in *your* mill, too.

Dowfroth 250 is easy to use—requires minimum conditioning for stage addition. Its water solubility permits accurate regulation as a water solution if you prefer this method. And it demonstrates little or no collecting power, which allows your operator to regulate frother and collector independently. This hard-working frother by Dow also spares the rubber covered parts on your flotation machines—shows minimum swelling and deterioration to save you money in maintenance.

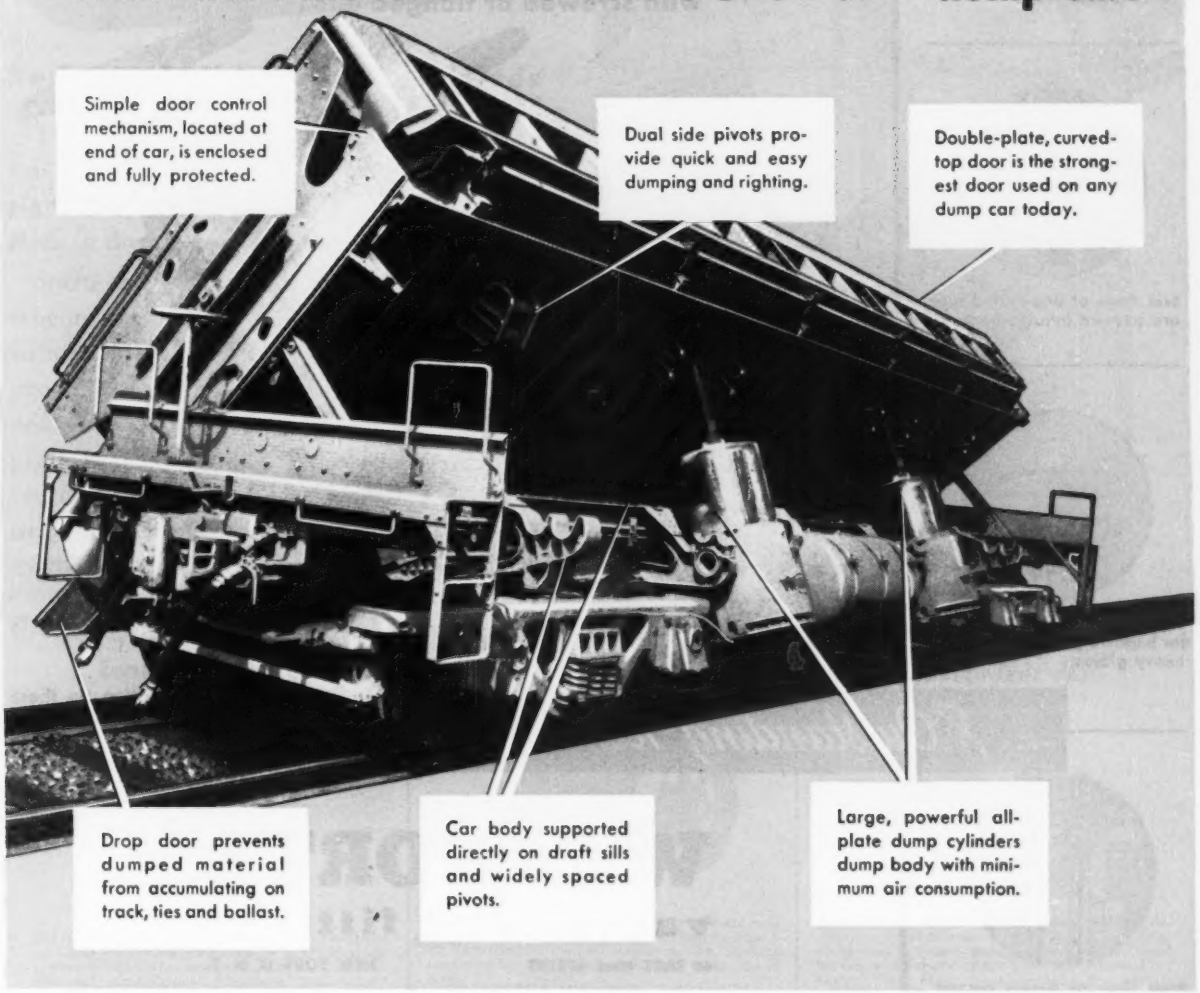
Prove the economy and efficiency of Dowfroth 250 in your own mill by using a test sample with our compliments. Write to THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. OC 834H.

you can depend on DOW CHEMICALS

DOW

You can save money

with these modern *Western* dump cars


Simple door control mechanism, located at end of car, is enclosed and fully protected.
Dual side pivots provide quick and easy dumping and righting.
Double-plate, curved-top door is the strongest door used on any dump car today.
Drop door prevents dumped material from accumulating on track, ties and ballast.
Car body supported directly on draft sills and widely spaced pivots.
Large, powerful all-plate dump cylinders dump body with minimum air consumption.

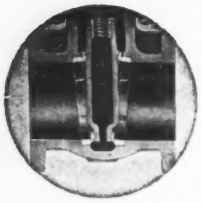
Modern Westerns have highly economical deadweight-to-payload ratio. Thanks to Westerns' design and the use of light but strong alloy steels, you get minimum haulage costs per ton-mile. And the rugged, maintenance-free construction of Westerns keeps operating and maintenance costs low and prolongs car-life.

Write Manager, Car Dept. 6908, Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pennsylvania, for further information about how you can cut your haulage costs with . . .

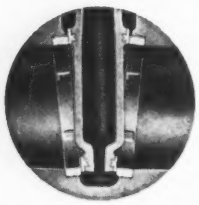
***Western* Cars . . . built by the world's largest manufacturer of dump cars**

BALDWIN - LIMA - HAMILTON

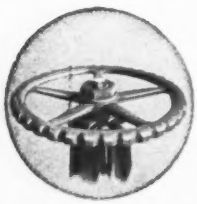
Philadelphia 42, Pa. • Offices in Principal Cities



Straight-Flow Port Design reduces fluid turbulence to a practical minimum.



Seat Rings of end-seated type are screwed into the body.



Sure-Grip Malleable Handwheel for non-skid gripping even with heavy gloves.

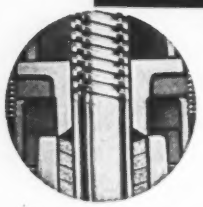
WALWORTH

iron body gate valves

with screwed or flanged ends

... 8 Outstanding Features

For complete information on these new Walworth Iron Body Valves, see your local Walworth distributor, or write for bulletin 106.



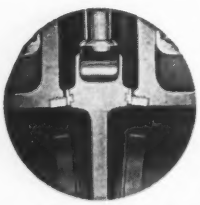
Brass Liner on Glands assures greater resistance to corrosion and scoring.

WALWORTH

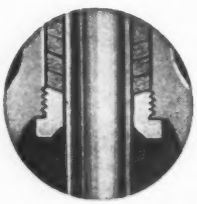
valves and fittings

60 EAST 42nd STREET NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

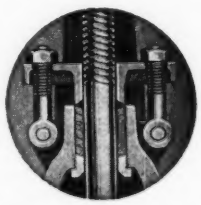


T-head Disc-to-Stem connection on OS&Y types provides stronger connection, prevents loosening of disc by corrosion.



Bronze Back-Seat Bushings in bonnets of OS&Y valves.

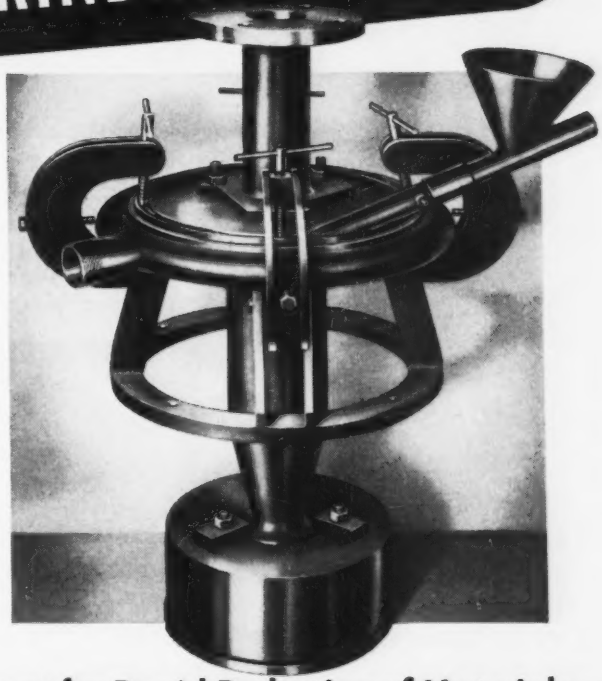
Solid Web Type Disc in OS&Y valves for greater strength and longer service.



Hinged Gland Eye-Bolts on OS&Y valves permit faster, easier repacking under full pressure.

Sturtevant

MICRONIZER* GRINDING MACHINE



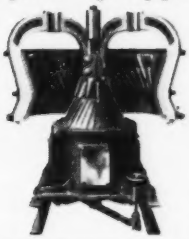
Reduces Solids to Micron Sizes

The new Sturtevant *Micronizer* grinding machine is a fluid jet grinder especially designed to reduce solid materials to particle sizes in the micron ranges.

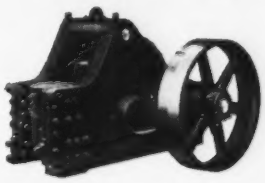
Sturtevant *Micronizers* are used for simultaneous dry grinding and classification of solids. The variety of materials that can be processed is large and includes both metallic and non-metallic minerals and ores, metals, pigments, insecticides, fungicides, pharmaceuticals, plastics, dyes and numerous other organic and inorganic products. Available in capacities from ½ to 3000 pounds per hour.

Other Sturtevant Pulverizing Equipment for Rapid Reduction of Materials...

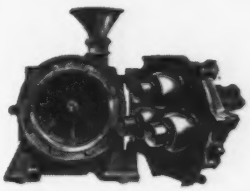
Especially Applicable for Initial Grinding of Products for the Micronizer Mill



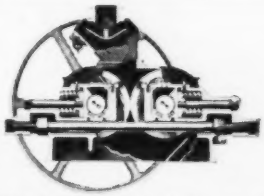
ROTARY FINE CRUSHERS for intermediate and fine reduction (down to ¼"). Open door accessibility. Soft or moderately hard materials. Efficient granulators. Excellent preliminary Crushers preceding Pulverizers.



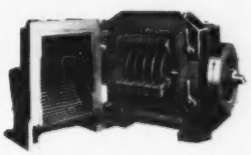
JAW CRUSHERS for coarse, intermediate and fine reduction of hard or soft substances. Heavy or light duty. Cam and Roller action. Special crushers for Ferro-alloys. Several types, many sizes.



RING-ROLL MILLS for medium and fine reduction (10 to 200 mesh), hard or soft materials. Very durable, small power. Operated in closed circuit with Screen or Air Separator. Open door accessibility. Many sizes. No scrapers, plows, pushers, or shields.



CRUSHING ROLLS for granulation, coarse or fine, hard or soft materials. Automatic adjustments. Crushing shocks balanced. For dry or wet reduction. Sizes 8 x 5 to 38 x 20. The standard for abrasives.



SWING-SLEDGE MILLS for coarse and medium reduction (down to 20 mesh). Open door accessibility. Soft, moderately hard, tough or fibrous substances. Built in several types and many sizes.

AIR SEPARATOR for separation of fines to 325 mesh and finer. Increases output from 25% to 300%... lowers power costs by 50%. Capacities ¼ to 50 tons per hour output.

*Registered trademark of the Sturtevant Mill Company

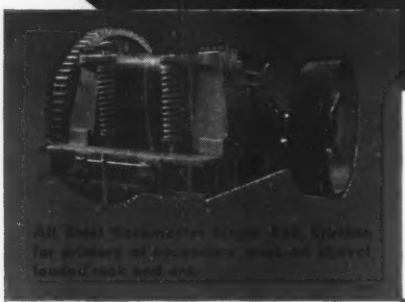
STURTEVANT MILL COMPANY

101 CLAYTON STREET, BOSTON 22, MASS.

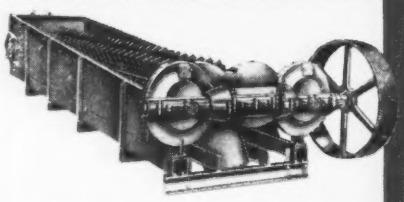
DESIGNERS & MANUFACTURERS OF DENS AND EXCAVATORS • MIXERS • SCREENS • PULVERIZERS • ELEVATORS • AND COMPLETE FERTILIZER UNITS

McLANAHAN

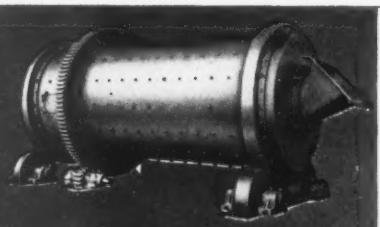
for dependable-low cost FEEDING, CRUSHING, CLEANING in



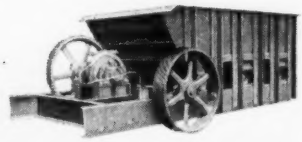
A pioneer in the development of many types of processing equipment, McLanahan has served domestic and foreign pits, mines and quarries for more than a century. Shown on this page are a few illustrations of McLanahan equipment for crushing, washing, sizing and conveying all types of ore, coal and rock. Technical details and price information will be sent upon request.



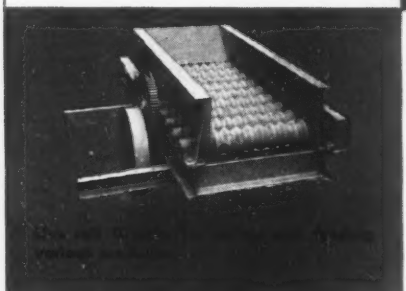
Log Washer for removing tough clay and soft rock from various materials.



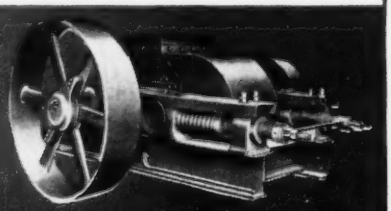
Steel Pebble Mill Scrubber—high capacity for cleaning large size feed.



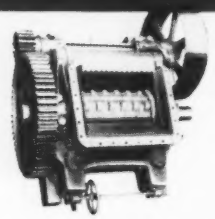
Heavy Duty Reciprocating Plate Feeder. Handles any material from sand sizes to shovel loaded rock and ore.



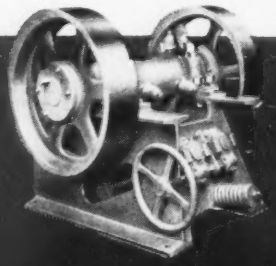
Double duty combination Scrubber and Sizing Screen for large and small capacities.



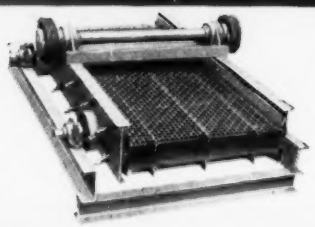
Heavy Duty Reversible Impact Breaker or Double Roll Crusher for secondary reduction.



Automatic Steelstrut Crusher for primary and secondary work in small plants.



Crusher for primary and secondary work.



Single and Double Deck Vibrating Screens in different sizes.

McLANAHAN & STONE CORPORATION

Pit, Mine and Quarry Equipment Headquarters Since 1835

Hollidaysburg, Pennsylvania

The Only Rotary Blast Hole Drill Capable of Drilling 12¼-in. Holes

The Bucyrus-Erie 50-R

Now, you can take full advantage of the large hole drilling technique with a rotary drill too—the Bucyrus-Erie 50-R. Here's a machine, designed to drill 9⅞ to 12¼-in. holes, which has proved its ability to drill these large diameter holes in the shortest time possible.

For example, a 50-R, operating on 6¾ hour shifts in a large Indiana open pit coal mine, drilled 2,598 holes of 10⅝-in. diameter to an average depth of 42 ft. in six months. The average drilling rate was 125.1 feet per hour for a total of 844.4 feet per shift. Overburden consisted of medium hard sandstone with an overlay of hard shale.

Look Over These Important 50-R Features

1 Down pressure on the bit is hydraulically powered for maximum controlled penetration.

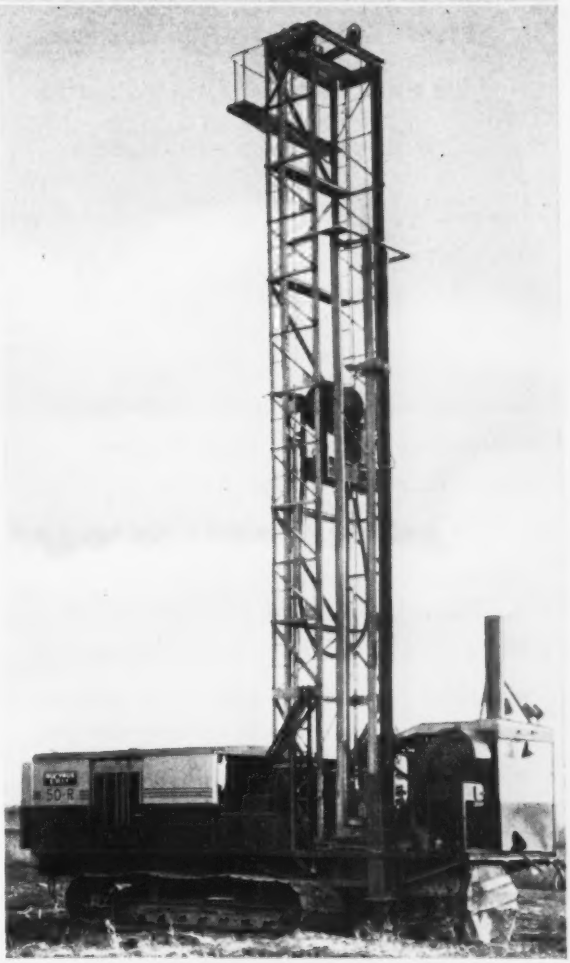
2 Ward Leonard electric control on rotation of drill pipe permits drilling at most efficient speed for a given formation.

3 Drills continuously for 32'-8" before an additional drill pipe section is added.

4 Drill pipe sections are added or removed in a few minutes with a remote-controlled, power-driven tool handling unit. No heavy manual labor is involved.

5 Cuttings are removed from the hole as drilling progresses by two 640-cfm air compressors. *Only the "fines"* are picked up and handled by the Roto-Clone precipitator. "Heavies" pile up adjacent to the drill hole for use as stemming material.

2854

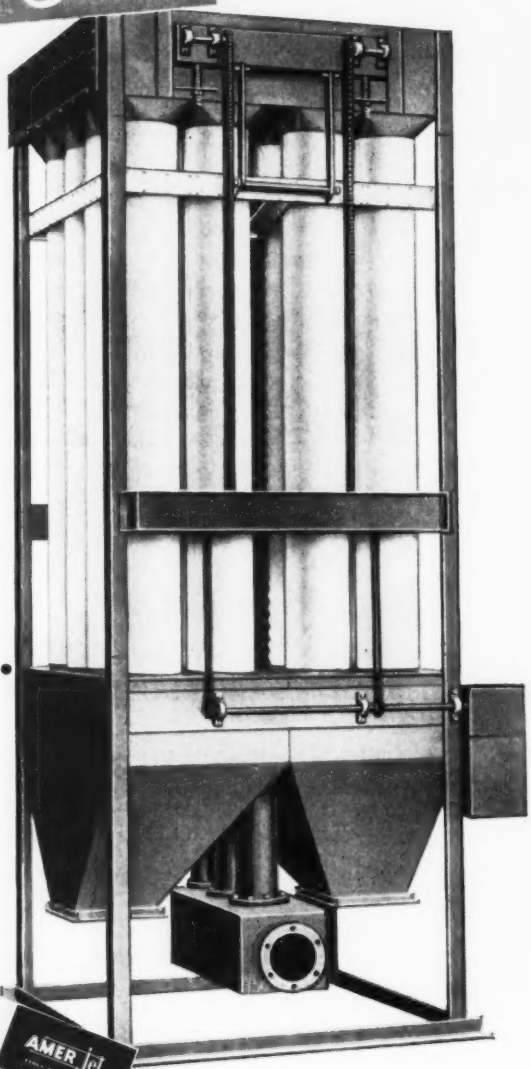


There are many more reasons why the 50-R is the finest rotary blast hole drill ever built. Write for complete information today on how the 50-R can save you money in your mine or quarry.

BUCYRUS ERIE

South Milwaukee, Wisconsin

Introducing AMERjet



A better REVERSE JET TYPE FABRIC DUST ARRESTER built to exacting AAF design and performance standards

Just what you'd expect from the leader! American Air Filter has developed and field tested a fabric-type dust arrester incorporating the same basic concept and design features found in all AAF Dust Control Products, namely—*small space requirements; maintained performance over a wide range of operating conditions; constant exhaust volume; high collection efficiency.*

With these proven advantages established, AAF engineers then "iced the cake" with these additional features to further increase AMERjet's over-all efficiency—

- **Tension control to compensate for variation in fabric dimensions due to humidity changes.**
- **Rugged, foolproof mechanism for dislodging collected material with high pressure jets.**
- **Venturi-shaped inlet for dust-laden air extends life of cloth by greatly reducing the abrading effect.**

AMERjet is available for handling any exhaust volume.

For complete information on this new dry-type dust collector, call your local AAF representative or write direct for Bulletin No. 279.

American Air Filter
COMPANY, INC.

193 Central Avenue, Louisville 8, Kentucky • American Air Filter of Canada, Ltd., Montreal, P. Q.

Better Taconite shooting with extra energy from Du Pont Pelletol

IN MINNESOTA OPEN-PIT OPERATIONS

On tough jobs, such as breaking hard-shooting Taconite ore, the blast can be made more effective by adding Du Pont Pelletol to "Nitramon"® or "Nitramex"® charges in vertical drill holes.

A free-running blasting agent, Pelletol is readily poured in the hole during loading. Pelletol settles to the bottom . . . supplements the strength of the basic charge by filling the annular space around the column.

Whenever open-pit operations call for extra strength, Pelletol is the answer. It offers the safest and most efficient method of providing maximum energy at the bottom of the hole.

If you are not already familiar with Du Pont Pelletol, it will pay you to find out how this free-running blasting agent can help you with your blasting problems. For more complete information about Pelletol and other members of the Du Pont blasting team, ask the Du Pont representative in your own district. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

DU PONT

BLASTING AGENTS

Products of Du Pont Research

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Rough-tough-rugged

The IRWIN GRANBY TYPE CAR

For Metal and Rock Mining . . .

Now from the makers of the famous, time-proven Irwin Mine Cars comes this heavy duty Granby type car. Designed and built especially to successfully withstand the shocks and rough treatment of high-production metal and rock mining.

Weighing 8000 pounds with a capacity of 133 cubic feet, this third rail dumper is strongly reinforced throughout by rugged I beams. Furnished in any capacity for any track gauge.

Cut your haulage costs and reduce maintenance the Irwin way. For further data write Dept. 513, Irwin Foundry and Mine Car Co., Irwin, Pennsylvania.

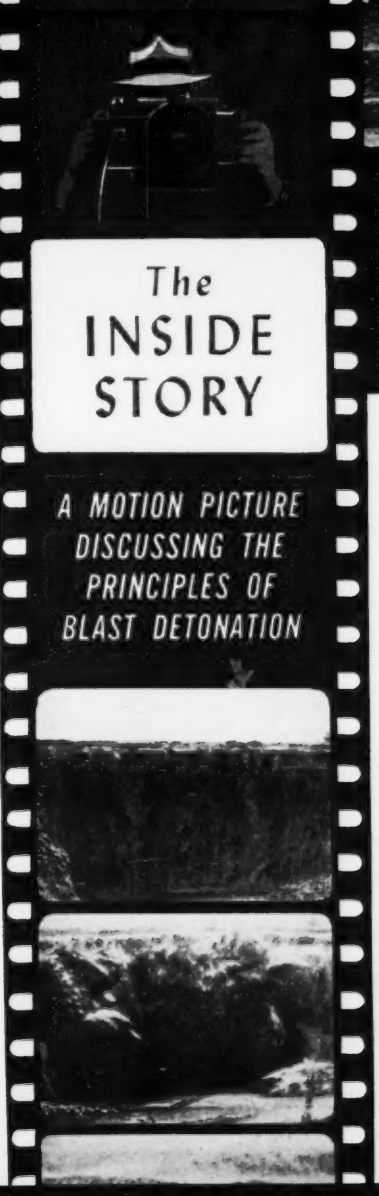
IRWIN

IRWIN FOUNDRY & MINE CAR COMPANY

PHONE 800 IRWIN, PA. BOX 311

MANUFACTURERS of MINE and INDUSTRIAL CARS Since 1903

New Atlas Movie Shows Advanced Blasting Techniques



THE NEW Atlas movie "The Inside Story," is a technical discussion of blasting methods used in quarries, strippings and construction work. It shows what happens between the firing of the cap and the blast of the explosives column. It shows how point of detonation affects rock movement . . . the most effective use of millisecond delays . . . the difference in action between progressive and alternate patterns . . . alternate velocity loading and what this new method will do toward refining millisecond delay blasting.

To get "The Inside Story" for your organization, simply write to the nearest Atlas office listed at right or to our home office. Let us know approximately when you will want it, the type of meeting you are planning and we will be glad to work out the arrangements at no cost to you.

BRANCH OFFICES

135 So. LaSalle St., Chicago 3, Ill. *Franklin 2-9530*

60 East 42nd Street, New York 17, New York *Vanderbilt 6-1730*

First National Bank Bldg. Tamaqua, Pa. *Tamaqua 1300*

No. 1 Montgomery Street San Francisco 4, California *Garfield 1-8640*

Joplin National Bank Building Joplin, Missouri *Joplin 924*

Hamilton National Bank Building Knoxville 3, Tennessee *Knoxville 2-2147*

Smithfield and Oliver Streets Oliver Bldg., Pittsburgh 22, Penna. *Atlantic 1-2684*

1320 Joseph Vance Building Seattle 1, Wash. *Main 5110*

ATLAS

ATLAS EXPLOSIVES

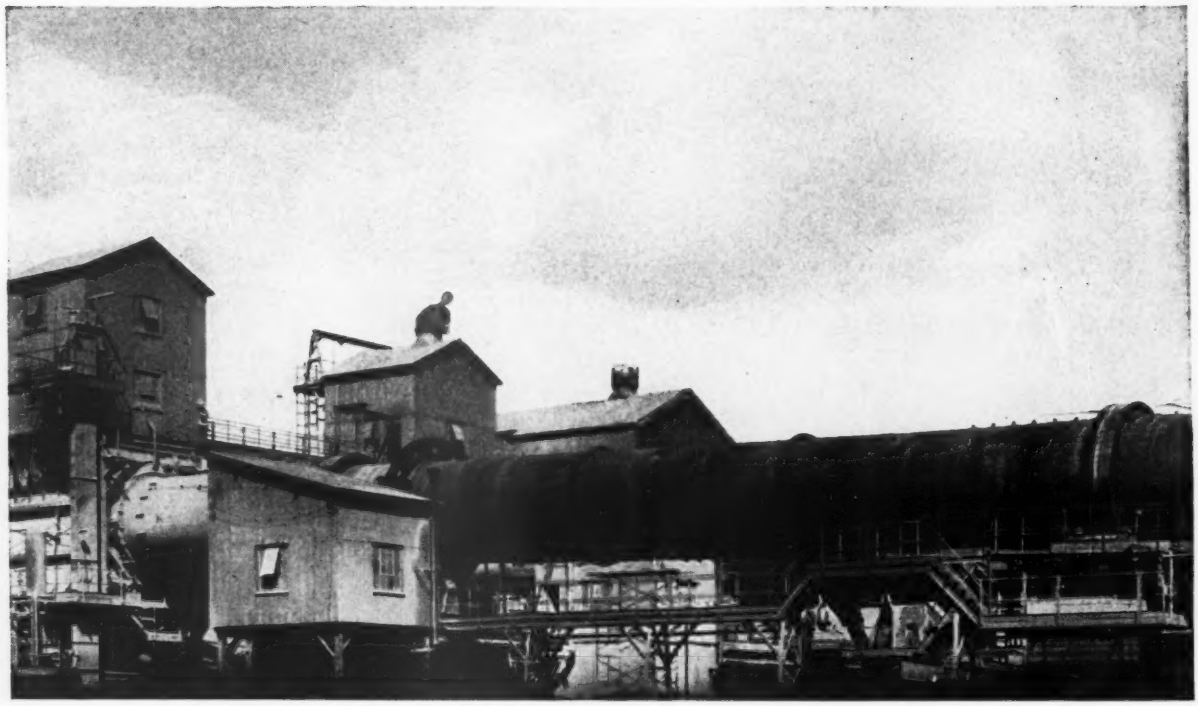
"Everything for Blasting"

ATLAS POWDER COMPANY, WILMINGTON 99, DELAWARE

Offices in principal cities

SPECIAL KILN...

designed and built by Vulcan for The New Jersey Zinc Co. (of Pa.)



The kiln illustrated above is designed with parts that are exceedingly heavy, because of its type of work. It is 11′3″ x 161′, used for the WAELZ Process. The supporting bearings, for example, are the largest ever made by Vulcan or any other company. Every other part of this mammoth kiln is correspondingly heavy. The drive is so arranged that the kiln may be driven from either the motor or an auxiliary steam turbine, which is capable of running the kiln at operating speeds.

Because of the product involved, the kiln is tightly sealed against the escaping of interior gases or the admission of outside air.

The above installation of a Vulcan Rotary Kiln again shows the result of fine co-operation between the engineering personnel at Vulcan and the engineering personnel and operators at The New Jersey Zinc Company (of Pa.). This great organization, together with many more throughout the United States and the World, have ordered and re-ordered Vulcan of Wilkes-Barre equipment: re-ordered because of its time-tested performance. If any information regarding kilns for any application is needed, the Vulcan Iron Works and its 105 years of experience is ready and able to serve you. Write for detailed Bulletin No. A-442, today.

Any information on items listed below will be sent to you immediately:

- Rotary Kilns, Coolers and Dryers
- Rotary Retorts, Calciners, Etc.
- Improved Vertical Lime Kilns
- Automatic Quick-Lime Hydrators
- Briquetting Equipment
- Open-Hearth Steel Castings
- Heavy Duty Electric Hoists
- Self-Contained Electric Hoists
- Cast-Steel Sheaves and Gears
- Diesel Locomotives
- Electric Locomotives and Larrys
- Steel Plate Fabrications
- Hydraulic Presses

VULCAN IRON WORKS

NEW YORK OFFICE
50 CHURCH ST., N.Y., N.Y.

WILKES-BARRE, PA., U.S.A.
ESTABLISHED 1849

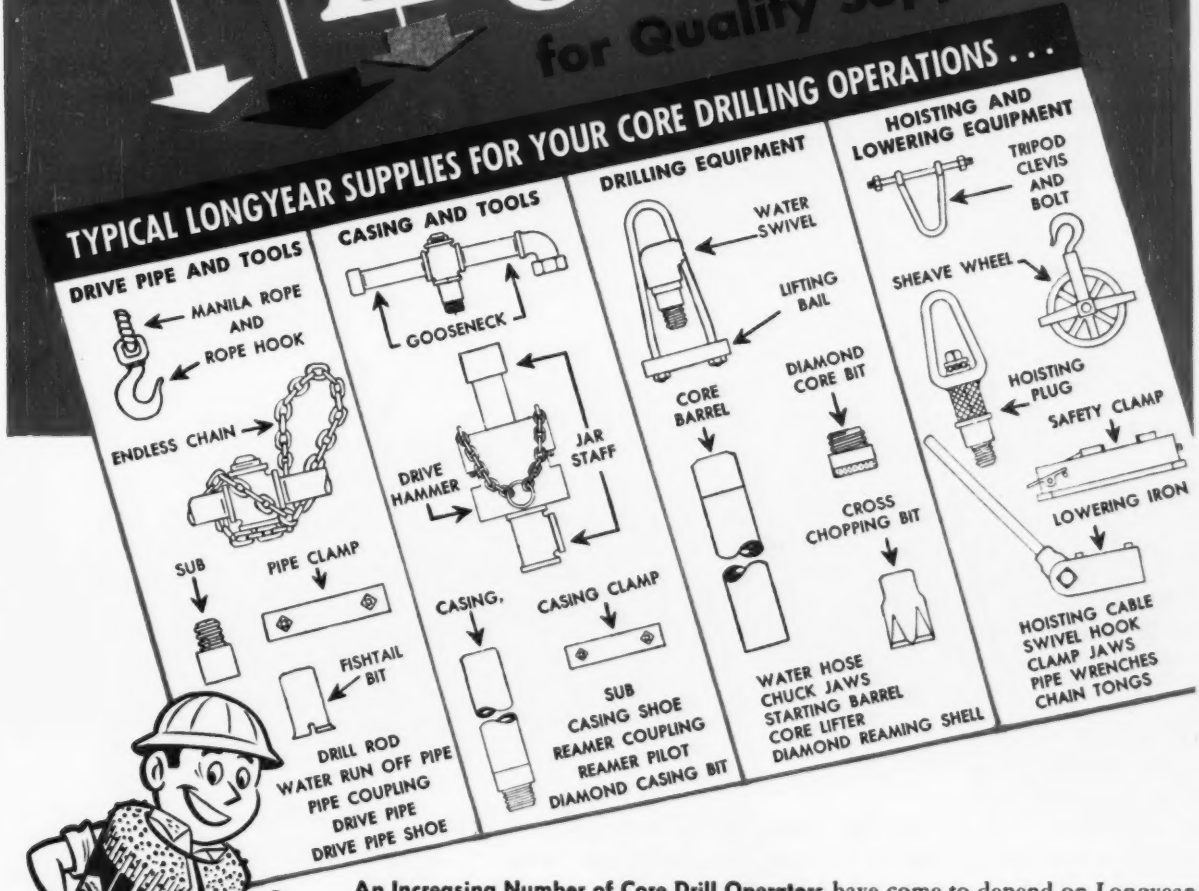
CABLE ADDRESS
"VULWORKS WILKESBARRE"

You Can Depend On

Longyear

for Quality Supplies

TYPICAL LONGYEAR SUPPLIES FOR YOUR CORE DRILLING OPERATIONS . . .



. . . Cores Tell The Story

An Increasing Number of Core Drill Operators have come to depend on Longyear for core drilling supplies. Longyear's exacting manufacturing standards and close inspections of finished products assure dependable operation at lower costs, and elimination of much lost time.

It is easy to obtain Longyear Quality in core drilling parts and supplies as a wide range of such equipment is always available.

Write today and let us send you check sheets which will help in planning your future requirements.

In U.S.A.
E. J. LONGYEAR COMPANY
Minneapolis 2, Minn.

Longyear

In Canada
CANADIAN LONGYEAR LTD.
North Bay, Ontario

DIAMOND CORE DRILLS • CONTRACT CORE DRILLING
SHAFT SINKING • GEOLOGICAL INVESTIGATIONS
REPRESENTATIVES IN PRINCIPAL MINING CENTERS IN THE UNITED STATES AND OTHER COUNTRIES

USED TO DESTRUCTION...NO RESHARPENING

Liddicoat

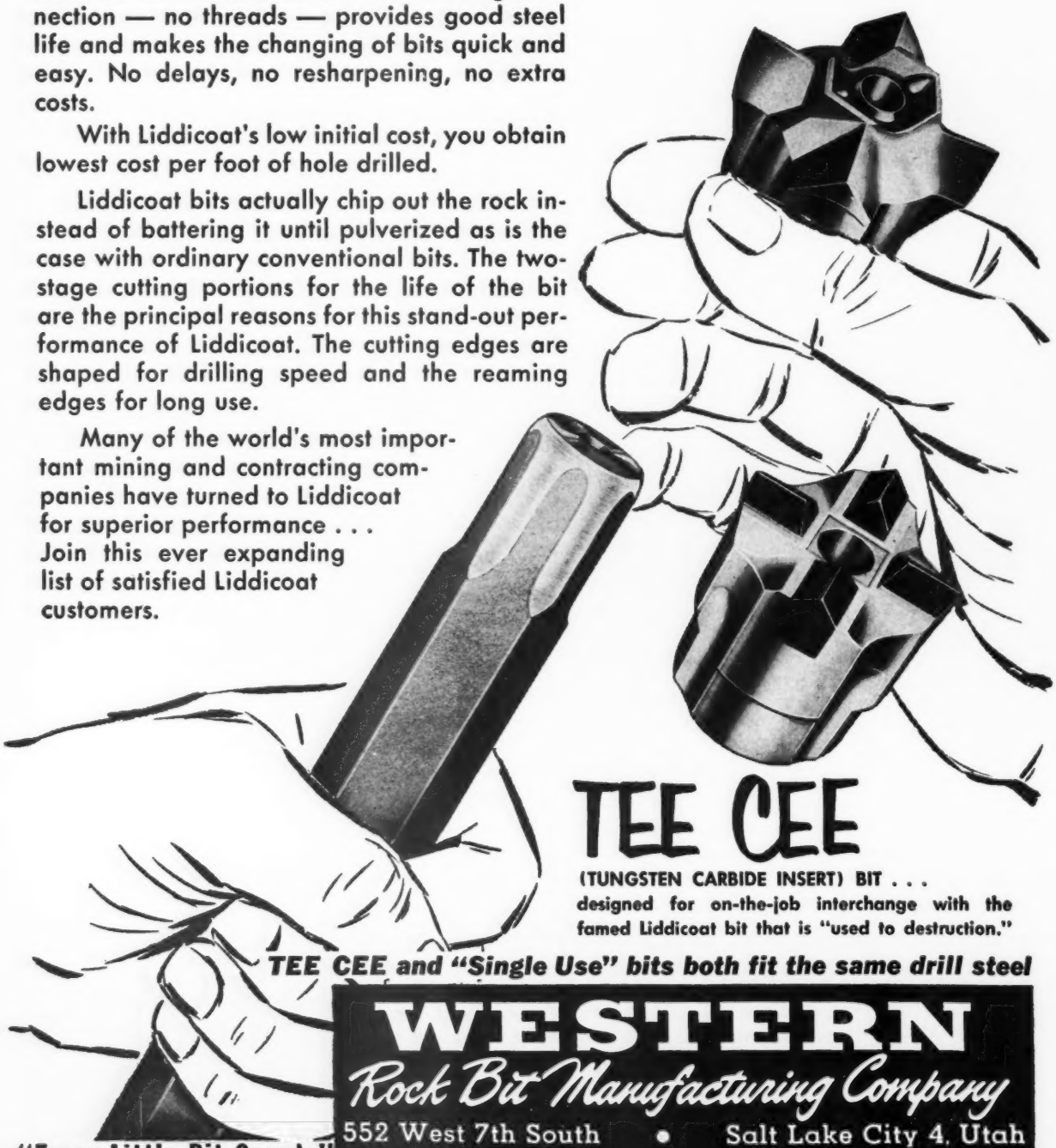
...the bit that drills farther, faster, for less

Liddicoat detachable bits are used to destruction and then discarded. The strong connection — no threads — provides good steel life and makes the changing of bits quick and easy. No delays, no resharpening, no extra costs.

With Liddicoat's low initial cost, you obtain lowest cost per foot of hole drilled.

Liddicoat bits actually chip out the rock instead of battering it until pulverized as is the case with ordinary conventional bits. The two-stage cutting portions for the life of the bit are the principal reasons for this stand-out performance of Liddicoat. The cutting edges are shaped for drilling speed and the reaming edges for long use.

Many of the world's most important mining and contracting companies have turned to Liddicoat for superior performance . . . Join this ever expanding list of satisfied Liddicoat customers.



TEE CEE

(TUNGSTEN CARBIDE INSERT) BIT . . .
designed for on-the-job interchange with the famed Liddicoat bit that is "used to destruction."

TEE CEE and "Single Use" bits both fit the same drill steel

WESTERN
Rock Bit Manufacturing Company
552 West 7th South • Salt Lake City 4, Utah

"Every Little Bit Counts"

GM DIESEL
CASE HISTORY No. 534-130

USER: Preskitt Brothers Mines, Birmingham, Alabama

INSTALLATION: GM 3-71 Diesel powers Buckeye ¾-yard shovel stripping overburden and coal.

PERFORMANCE: Has worked 40 hours per week for 6 years—about 12,000 hours—with no repairs on engine. Uses about 2½ gallons of fuel per hour.

It pays to STANDARDIZE on

GM
GENERAL MOTORS
DIESEL POWER

Six Years' Tough Stripping

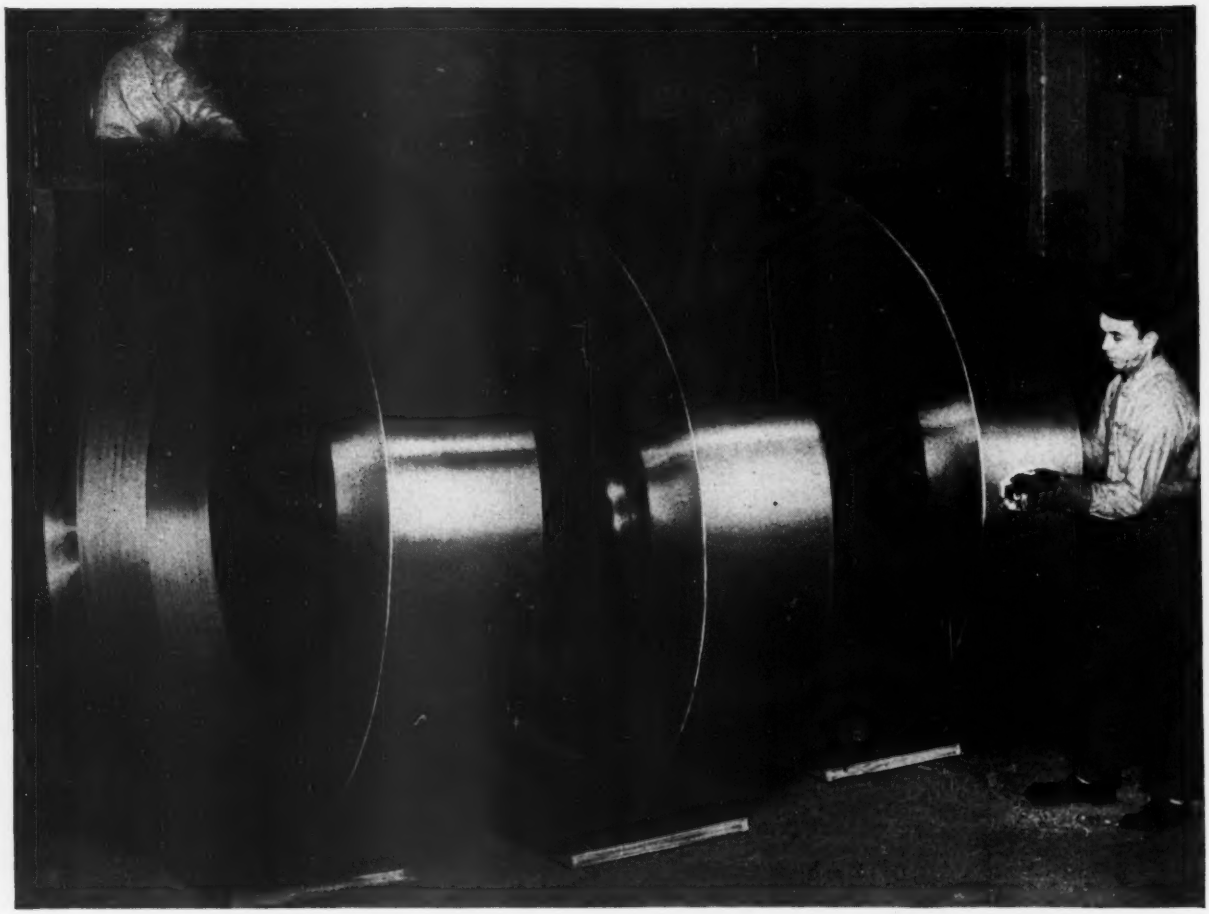
Not One Dime for Engine Repairs

S. O. Preskitt reports his men never laid a wrench on the GM Diesel powering this Buckeye shovel in 6 years of tough operation. It clocked approximately 12,000 hours stripping coal and overburden without a dime for engine repairs.

Sturdy, dependable General Motors 2-cycle Diesels deliver more power at less cost on all kinds of jobs. Two-cycle operation with power on every piston downstroke means faster acceleration, quicker response to controls, increased production. These smooth-running Diesels stay on the job day in and day out, but when service *is* needed, a phone call to your local GM Diesel distributor brings quick service and fast delivery of low-cost parts. Clean, simple design makes maintenance easy and economical.

Call your GM Diesel distributor today. Let him show you how to get more power at less cost in new equipment or in your present rigs.

DETROIT DIESEL ENGINE DIVISION
GENERAL MOTORS • DETROIT 28, MICHIGAN
Single Engines . . . 16 to 275 H.P. Multiple Units . . . Up to 840 H.P.



MIDVALE ROLL SHELLS *Stand The Grind*

Tougher, higher resistance to abrasion that "goes down deep" to provide longer service . . . cuts your cost per ton crushed – that describes Midvale Roll Shells.

Midvale Roll Shells combine maximum toughness with remarkable freedom from breakage, and plenty of "bite." Their manufacture is controlled from the ingot to the final machining in Midvale's own plants. We make and shape our own steel for roll shells to stand up and take the toughest wear. The performance records of Midvale Roll Shells in leading mines, smelting companies and quarries prove it.

Bring your roll shell and other machinery maintenance problems to Midvale. Let us recommend the best material to save you costly breakdowns . . . to lower your cost per ton crushed.

THE MIDVALE COMPANY-Nicetown, Philadelphia 40, Pa.

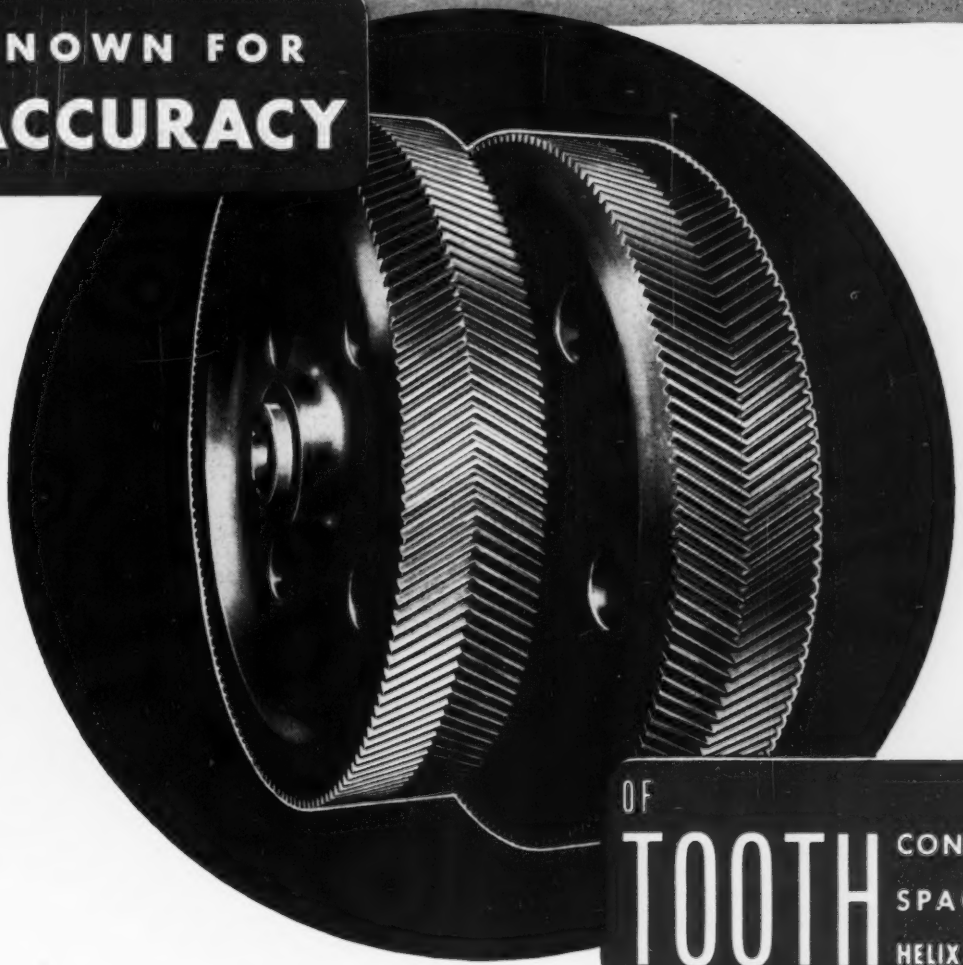
Offices: New York, Chicago, Pittsburgh, Washington, Cleveland, San Francisco

MIDVALE

FORGINGS, ROLLS, RINGS, FLANGES, STAINLESS STEEL CASTINGS

PHILADELPHIA HERRINGBONE GEARS

KNOWN FOR
ACCURACY



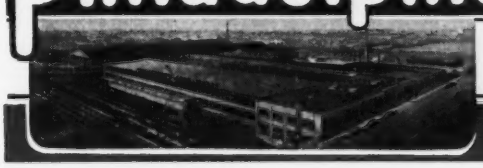
OF
TOOTH
CONTOUR
SPACING
HELIX ANGLE

Continuous tooth construction gives great load carrying capacity with a smooth flow of power. Made by Philadelphia, their high quality results from selected materials, controlled manufacture and careful inspection.

Philadelphia Continuous Tooth Herringbone gears are available in sizes up to 60" diameter, 18" face.

For full information send for our Gear Catalog.

Philadelphia Gear Works, INC.



ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK · PITTSBURGH · CHICAGO · HOUSTON · LYNCHBURG, VA.

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

Completing Our

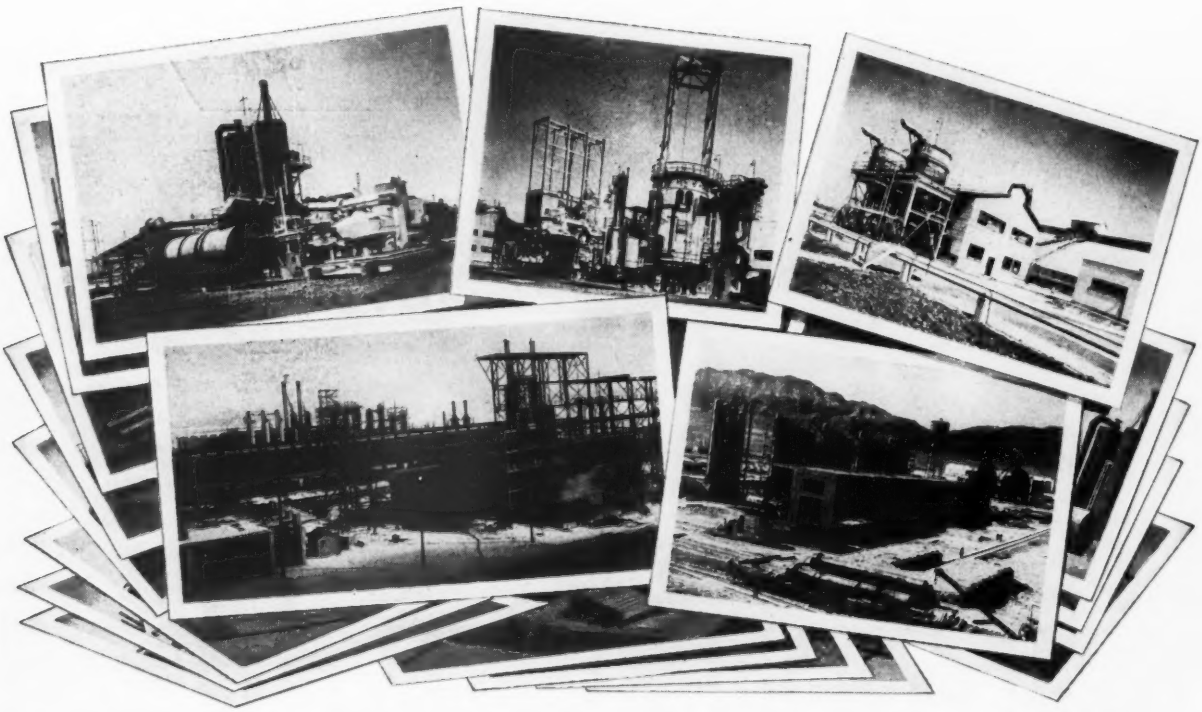
40th

Year of Service to the Chemical Industry

Generally, there's not much point in telling people how long you've been in business. But it so happens that the 40 years of Chemico's existence also marks the period of greatest growth of this country's huge chemical industry. Chemico is proud of its part in the development of this industry . . . a development that required more than a little pioneering courage.

They say that "Life begins at 40" because that age combines seasoned judgment with youthful vigor. At this 40th Anniversary Chemico certainly offers experience, initiative and the assurance that you can, as always, depend upon the promise in our slogan:

"Chemico plants are profitable investments"



CHEMICAL CONSTRUCTION CORPORATION

A UNIT OF AMERICAN CYANAMID COMPANY

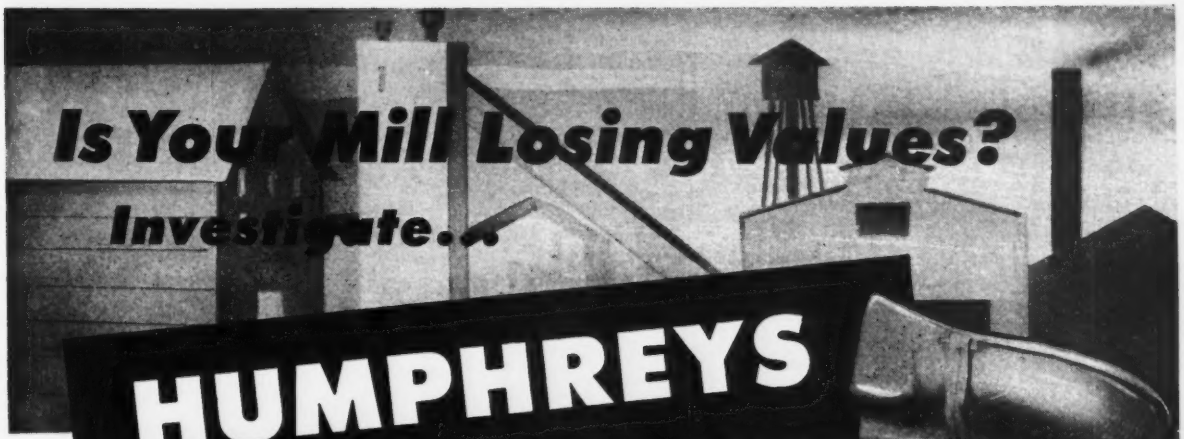
488 MADISON AVENUE, NEW YORK 22, N. Y.

CABLES: CHEMICONST, NEW YORK

TECHNICAL REPRESENTATIVES: CYANAMID PRODUCTS LTD., LONDON • CHEMICAL CONSTRUCTION (INTER-AMERICAN) LTD., TORONTO • SOUTH AFRICAN CYANAMID (PTY) LTD., JOHANNESBURG

CHEMICO CHEMICAL CONSTRUCTION CORP.

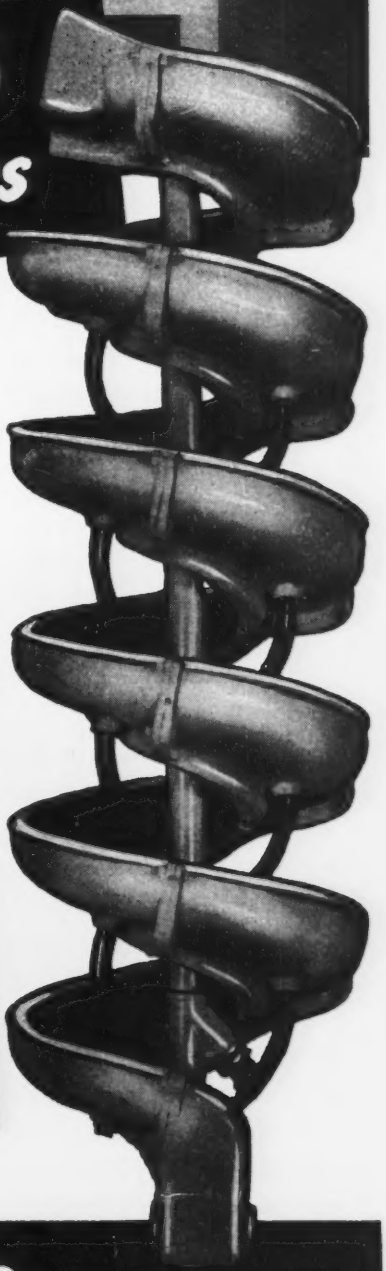
CC-860



Is Your Mill Losing Values?

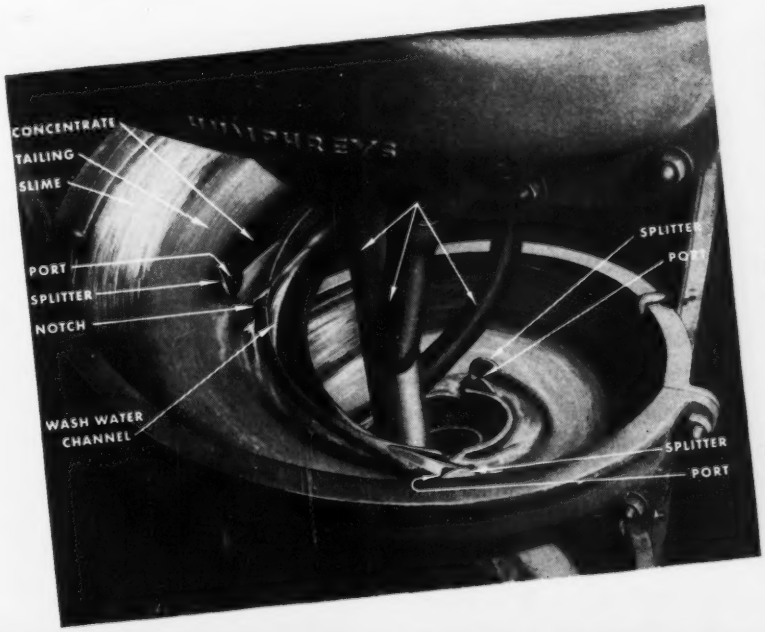
Investigate...

HUMPHREYS
Spiral Concentrators



Low-Cost Concentration

Humphreys Spirals offer low cost operation, maintenance, installation. Small floor space. No moving parts.



The Humphreys Investment Co.
ENGINEERING DIVISION

914 First National Bank Building
Denver 2, Colorado

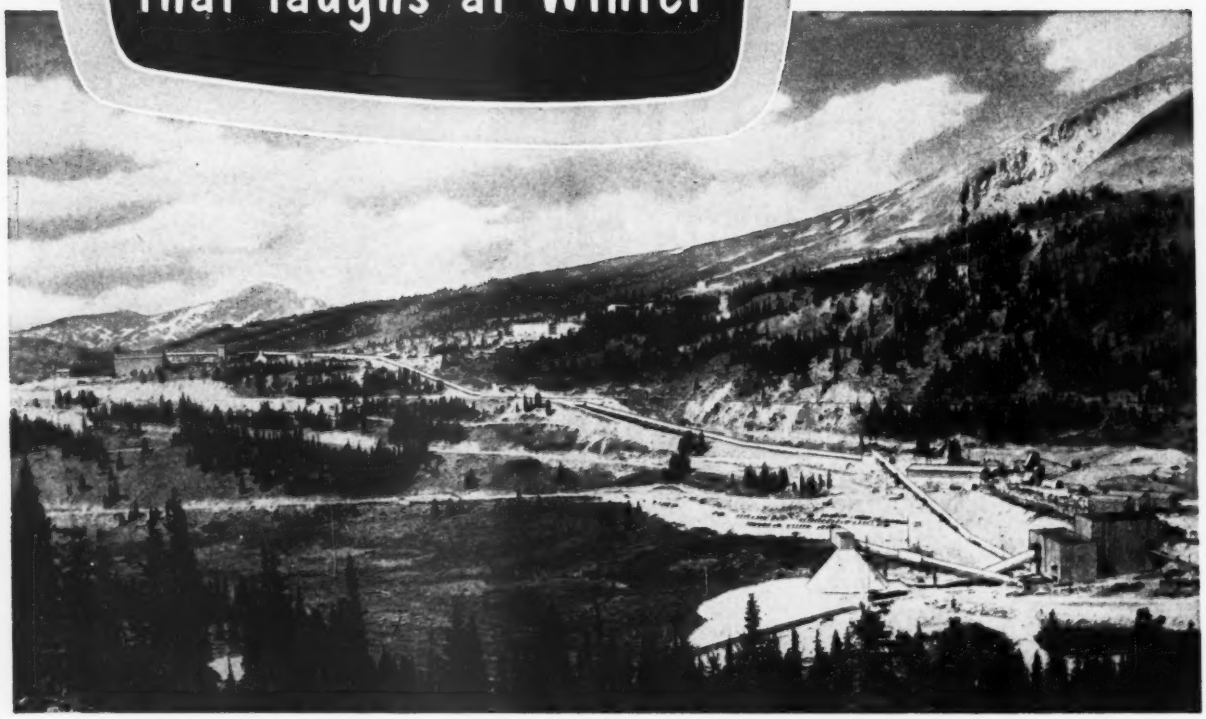
Manufacturing and Sales Agents

AUSTRALIA: John Carruthers & Co. Pty. Ltd., Edgecliff, N.S.W.

SOUTH AFRICA: Edward L. Bateman Ltd., Johannesburg

SWEDEN: Sala Maskinfabriks A-B, Sala

A rubber railroad that laughs at Winter



In rugged "high country" famed for tough weather, a large western mining company wanted to move ore at an ultimate capacity of 2,000 tons per hour for a distance of nearly a mile and a gain in elevation of some 350 feet . . . and maintain capacity in mid-winter as well as in summer.

Stearns-Roger designed and constructed a conveyor system that does the trick. Its 42" wide belt operating in four sections, is housed in a barrel-ceiling enclosure. This structure is fully insulated and is heated by electricity for efficient operation even when outside temperatures slide to minus 30° F.

Here again, Stearns-Roger has demonstrated its ability to employ basic methods of known efficiency and economy, and to adapt those methods to special operating conditions.

Look to **Stearns-Roger** for undivided responsibilty in

ENGINEERING
DESIGNING
MANUFACTURE
CONSTRUCTION

Stearns-Roger

THE STEARNS-ROGER MFG. CO. DENVER COLORADO

DENVER • HOUSTON • SALT LAKE CITY • EL PASO

LASTING POWER for Long Hauls . . .

THANKS TO BATTERY POWER!

Travel distances for shuttle cars have increased with the demand for increased coal production. Battery capacity and endurance have increased, too. Battery-power now is capable of propelling cars longer distances, for longer periods, with greater efficiency and at lower cost than any other type of power! Only with battery power do you get complete maneuverability, flexibility, adaptability and SAFETY to meet modern underground hauling needs. And remember, there's *no* battery power like *Gould* power.

Specify
THE GOULD "THIRTY"
with New Diamond "Z" Grids—
America's Finest
Mine Shuttle Car Battery

GOULD *INDUSTRIAL BATTERIES*

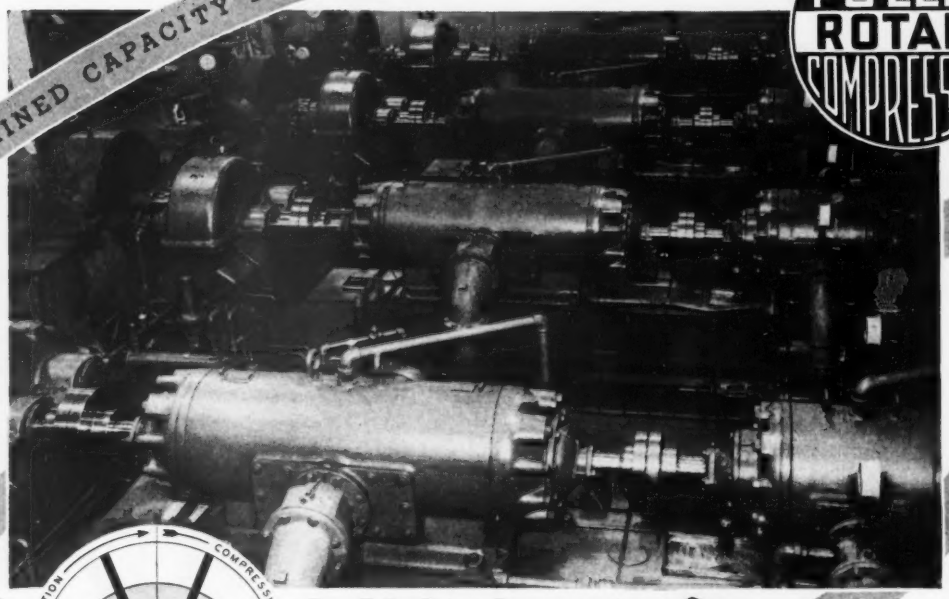
GOULD-NATIONAL BATTERIES, INC., TRENTON 7, N. J.

Always Use Gould-National Automobile and Truck Batteries

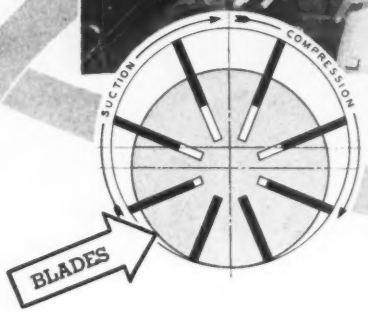
©1953 Gould-National Batteries, Inc.

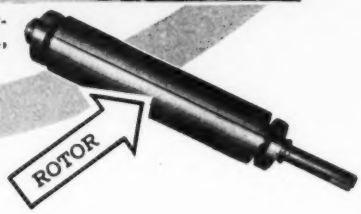
MAINTAINED CAPACITY FOR THE LIFE OF THE MACHINE

FULLER ROTARY COMPRESSORS



Four Fuller Rotary Compressors, turbine driven, total capacity 6760 c.f.m., 110-lb. p.s.i.





Due to design and construction, the blades of a Fuller Rotary Compressor automatically compensate for wear, thus eliminating loss of capacity. ***Maintained capacity*** is just one of the many outstanding features of the Fuller Rotary.

The fewer moving parts that make up any piece of equipment, the more continuous service at the lowest operating cost. Fuller Rotary Compressors are an outstanding example of simplicity . . . few moving parts—rotor, bearings, blades.

There is no adjustment of valves, no grinding of seats, no bearing take-up . . . moving parts are reduced to the minimum, all of which means fewer shut-downs, with less costly maintenance charges. Shut-downs are costly . . . lost time can never be recovered. Install Fuller Rotaries for day in and day out, continuous service.

Fullers are built for capacities to 3300 c.f.m. actual free-air delivery, 125-lb. pressure. Write for Bulletin C-6, illustrating and describing the design and construction of this modern compressor.

FULLER COMPANY, Catasauqua, Pa.
120 So. LaSalle St.—Chicago 3
420 Chancery Bldg.—San Francisco 4

Fuller

C-229

PIONEERS OF HIGH-EFFICIENCY VANE-TYPE ROTARY COMPRESSORS

big... ANY WAY YOU LOOK AT IT

BIG IN CAPACITY. BIG IN EFFICIENCY. BIG IN EARNING POWER.

Hauling up to 24 cubic yards, only these Macks deliver so many specific working advantages to big yardage strip-mine operators.

A fast cycle from shovel to tipple or dump, assured by the high maneuverability of Mack dumper design and the easy control of power-steering.

All-weather operation regardless of terrain because Mack six-wheelers have the famous Balanced Bogie that won't bog down. Only Mack offers the exclusive Power Divider which distributes torque between bogie axles in proportion to traction, pulls through where ordinary trucks mire in.

Safety plus real driver satisfaction with masterful air-actuated brakes and easy-to-operate air-assist clutch.

The right powerplant to haul most efficiently, most profitably for each specific operation, provided by a complete range of engine options up to 400 horsepower coupled with the most rugged transmissions yet developed.

WHEREVER YOU SEE A TOUGH JOB . . .
THERE IS WHERE YOU SEE MACKS

Mack TRUCKS

Mack Trucks, Empire State Bldg., N. Y. 1, N. Y. Factory branches and distributors in all principal cities for service and parts. In Canada: Mack Trucks of Canada, Ltd.

COMPANHIA VALE DO RIO DOCE S. A.

ITABIRA IRON ORE FOR OPEN HEARTH FURNACES

VALUE

ANALYSIS PERCENTAGES GUARANTEED BY CONTRACT

Fe	(Guaranteed minimum)	68.5
P	(Guaranteed maximum)	.045
Moisture	(Guaranteed maximum)	1.0

Recent shipments have averaged about .80% Moisture, 69.01% Fe, .028% P, and .27% SiO_2. Sizes are half inch to eight inches.

Steel companies now using ITABIRA IRON ORE as charge and feed ore report substantial savings in operating costs. These result principally from hard structure, low moistures, high iron content and absence of impurities. Important reductions in the use of STEEL SCRAP have been achieved in open hearth operations by using higher percentages of ITABIRA ORE in the charge.

Its use in all phases of Steel production is constantly increasing. The excellent yields being realized are attributed to the unique properties of ITABIRA ORE.

Inquiries should be addressed to the Vale do Rio Doce Trading Company, 63 Wall St., New York 5, New York.

COMPANHIA VALE DO RIO DOCE S. A.

RIO de JANEIRO BRAZIL

Underwater operation holds no peril for these Hazacord cables. Skid mounted junction box contains four 400 amp. circuit breakers . . . single cable leads from transformer bank; four branch circuits go to the control house near the shovel (below). The 500 horsepower motor which operates the pit-pump used for pumping the phosphate-bearing matrix to the washer also gets its power through Hazacords.

Grabbing 17 yards of phosphate rock in a single bite, this enormous dragline supplies raw material for fertilizers and chemicals produced by the Virginia-Carolina Chemical Corporation. Power is furnished by thousands of feet of Type SH-D, 5000-volt Hazacord cable.

Hazard's exclusive ZBF sheath—cured under pressure in a continuous metal mold—is one reason why Hazacord cable can take the rough treatment it gets being dragged over this rugged Florida terrain.

CHEMICALS VC® SELECTS

LONG-LIVED HAZACORD SHOVEL CABLES FOR RUGGED PHOSPHATE MINING OPERATION

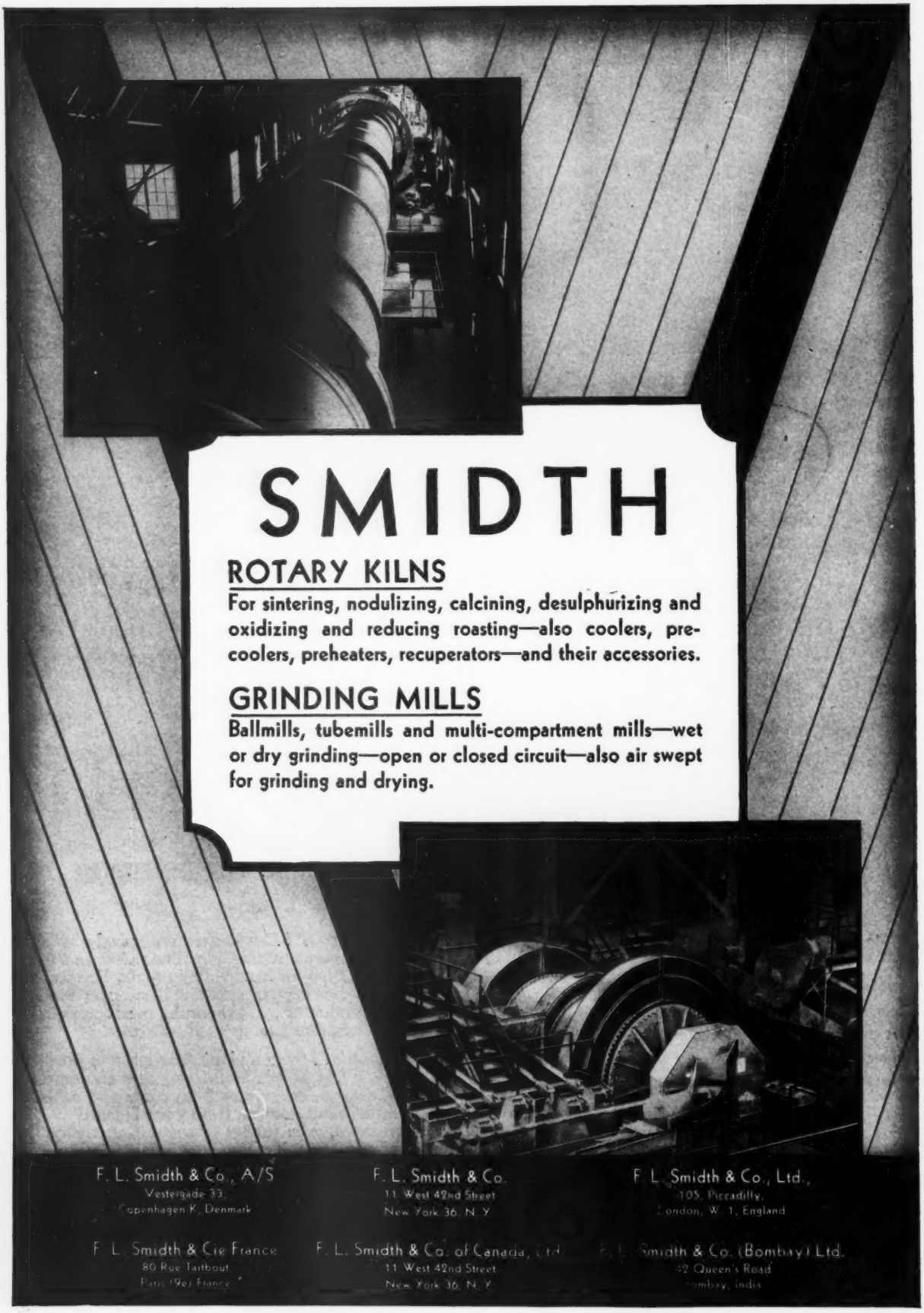
Hazacord Type SH-D was used exclusively by V-C for this important mining job. The safest and most widely used type for high-voltage work, Hazacord Type SH-D has copper shielding braid over each insulated conductor . . . grounding conductors in the interstices. For use up to 15000 volts.

On *every* job . . . from a giant dragline to a portable electric saw, Hazacords are setting new standards for long, economical service from cords and cables. Get complete information from your Hazard representative, your jobber or write to us today. Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pennsylvania.

HAZARD WILKES-BARRE, PA.

HAZACORD *Mold-Cured* **portable cables**

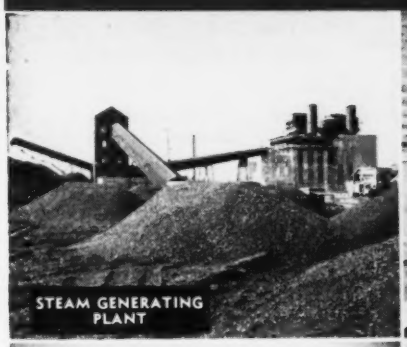
1403


SMIDTH
ROTARY KILNS
For sintering, nodulizing, calcining, desulphurizing and oxidizing and reducing roasting—also coolers, pre-coolers, preheaters, recuperators—and their accessories.
GRINDING MILLS
Ballmills, tubemills and multi-compartment mills—wet or dry grinding—open or closed circuit—also air swept for grinding and drying.
F. L. Smidth & Co., A/S
Vestergade 33,
Copenhagen K, Denmark
F. L. Smidth & Co.
11 West 42nd Street
New York 36, N. Y.
F. L. Smidth & Co., Ltd.,
105, Piccadilly,
London, W. 1, England
F. L. Smidth & Cie France
80 Rue Taitbout
Paris (9e) France
F. L. Smidth & Co. of Canada, Ltd.
11 West 42nd Street
New York 36, N. Y.
F. L. Smidth & Co. (Bombay) Ltd.
42 Queen's Road
Bombay, India

MATERIALS HANDLING!

There's a Continental Conveyor for every industry.

When you have a conveying or elevating problem — specify **Continental**

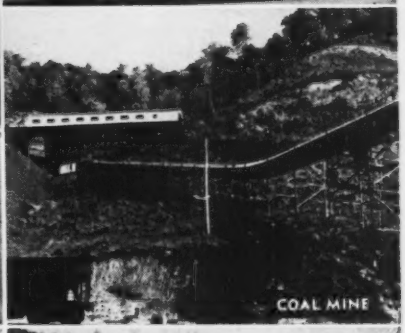

STEAM GENERATING PLANT

FERTILIZER PLANT

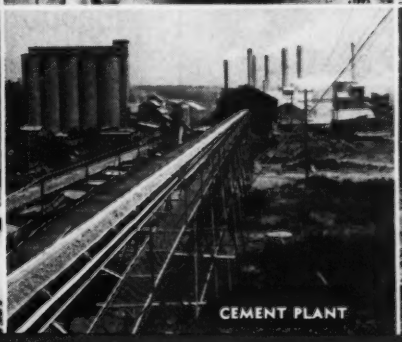
COTTONSEED OIL MILL

GRAIN HANDLING

FEED MILL


COAL MINE

TEXTILE MILL


CEMENT PLANT

QUARRY

BELT CONVEYORS, SCREW CONVEYORS, APRON CONVEYORS, BUCKET ELEVATORS
PLATE OR APRON FEEDERS, TRIPPERS, BELT BRUSHES, PULLEYS, SPROCKETS AND CHAIN
PILLOW BLOCKS, BELTING, SPEED REDUCERS, POWER TRANSMISSION EQUIPMENT
FABRICATED STEEL, MEEHANITE CASTINGS, SPECIAL MACHINE WORK

Send us your orders and inquiries.

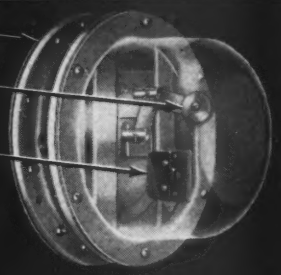
INDUSTRIAL DIVISION

CONTINENTAL GIN COMPANY

BIRMINGHAM, ALABAMA

ENGINEERS CGC ATLANTA • DALLAS • MEMPHIS • NEW YORK CGC MANUFACTURERS

1. Diaphragm
2. Counterweight
3. Switch



THAT'S ALL

WORLD'S SIMPLEST BIN LEVEL INDICATOR

BIN-DICATOR

NO MOTORS • NO SPRINGS • NO OILING

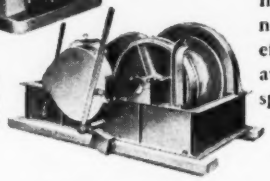
This is the first simple, dependable, low-cost automatic bin level indicator. Units installed 20 years ago are still in daily use. Watches *and reports* material levels in bins, silos, hoppers, chutes, etc.; automatically starts, stops filling machinery. Free catalog. Write—

THE BIN-DICATOR CO.
13946-R1 Kercheval Avenue • Detroit 15, Michigan

"Superior" Electric Carpullers

CAPSTAN TYPE, DRUM TYPE AND SPECIAL TYPES

Model SC Superior Capstan Carpuller



Model EP Drum Type Carpuller

One man can move hundreds of tons of rolling load with practically no effort. Economical, efficient, Carpullers are available for your specialized requirements.

Write for bulletins and catalogs!

Designed and Manufactured by
SUPERIOR-LIDGERWOOD-MUNDY CORPORATION
Main Office and Works: SUPERIOR, WISCONSIN, U.S.A.
New York Office, 7 Dey Street, New York 7, N. Y.

Core Drilling by Contract

Exploration for coal and other mineral deposits. Foundation test boring and grout hole drilling for bridges, dams and all heavy structures.
Core Drill Contractors for more than 60 years

JOY MANUFACTURING CO.
Contract Core Drill Division
MICHIGAN CITY, INDIANA

If there is
something you want . . .
that other readers of this paper can supply
or —
something you don't want . . .
that other readers can use, advertise it in the
SEARCHLIGHT SECTION
(Classified Columns)
of this paper

ALLUVIAL DEPOSITS
Gold Tin Columbite Titanium Bauxite

Most accurately and economically tested for . . . with the

EMPIRE DRILL
NEW YORK ENGINEERING COMPANY
75 West St., N. Y. City, U.S.A. Cable Address NYECO, N.Y.

CORE DRILLING
—anywhere!
"We look into the Earth"
• Mineral Prospecting
• Foundation Test Borings and Grouting
• Large diameter holes for Ventilation and Escapeways

PENNSYLVANIA Drilling CO.
DRILLING CONTRACTORS & MFRS.
1205 Chartiers Ave. PITTSBURGH, PA. WAlnut 1-5816

Right from every angle to bear heavier loads with less maintenance

The basic precision principle of right-angle design is translated by Rollway into a bearing that rotates with least friction under practically all heavy-load conditions.

Precisely-made ends, rollers and slots afford little opportunity for sliding friction, side-shock, end-rub or skew to cause premature failure.

Straight solid-cylindrical rollers provide the long line-contact necessary to support heavy loads. The use of special alloys restricts spalling or indentation of the race.

The net result is a bearing that stands up—longer—with far less maintenance and replacement.

In the heavy-duty equipment field, Rollway Bearings are recognized for their long, trouble-free service life. Whether you're a maker or a user, you'll *"roll right with Rollway."* Rollway Bearing Co., Inc., Syracuse, N. Y.

Rollway engineers are available for consultation without cost or obligation. Write or call your nearest Rollway office:

Boston	Chicago	Los Angeles
Detroit	Houston	Pittsburgh
Milwaukee	Philadelphia	San Francisco
Syracuse	Toronto	Seattle
	Cleveland	

ROLLWAY
BEARINGS
Complete Line of Radial and Thrust Cylindrical Roller Bearings

BONUS

A YEAR END PREMIUM
SHOWS UP EVERY MONTH
IN THE OPERATION OF

"BOOTH FLOTATION"

BETTER PULP CIRCULATION
AND AERATION PLUS

"PAYS DIVIDENDS"

NEVER BE SATISFIED WITH
JUST GOOD RESULTS.
GET THE BEST WITH

BOOTH

WRITE FOR INFORMATION

BOOTH ENGINEERS

146 SO. WEST TEMPLE • SALT LAKE CITY, UTAH

MINERALS SEPARATION • SERVICE • EQUIPMENT

A tip for top performance

TeeCee
TUNGSTEN CARBIDE

&

"TYPE L"
ONE PASS STEEL

LIDDICOAT

DETACHABLE
DRILL BITS

MANUFACTURED BY

Thompson Products

THOMPSON PRODUCTS LTD. • ST. CATHARINES, ONT.

How to keep informed on the

"with what"

part of your business

AT YOUR FINGER TIPS, issue after issue, is one of your richest veins of job information – advertising. You might call it the "with what" type – which dovetails the "how" of the editorial pages. Easy to read, talking your language, geared specifically to the betterment of your business, this is the kind of practical data which may well help you do a job quicker, better – save your company money.

Each advertiser is obviously doing his level best to give you helpful information. By showing, through the advertising pages, how his product or service can benefit *you* and *your* company, he is taking *his* most efficient way toward a sale.

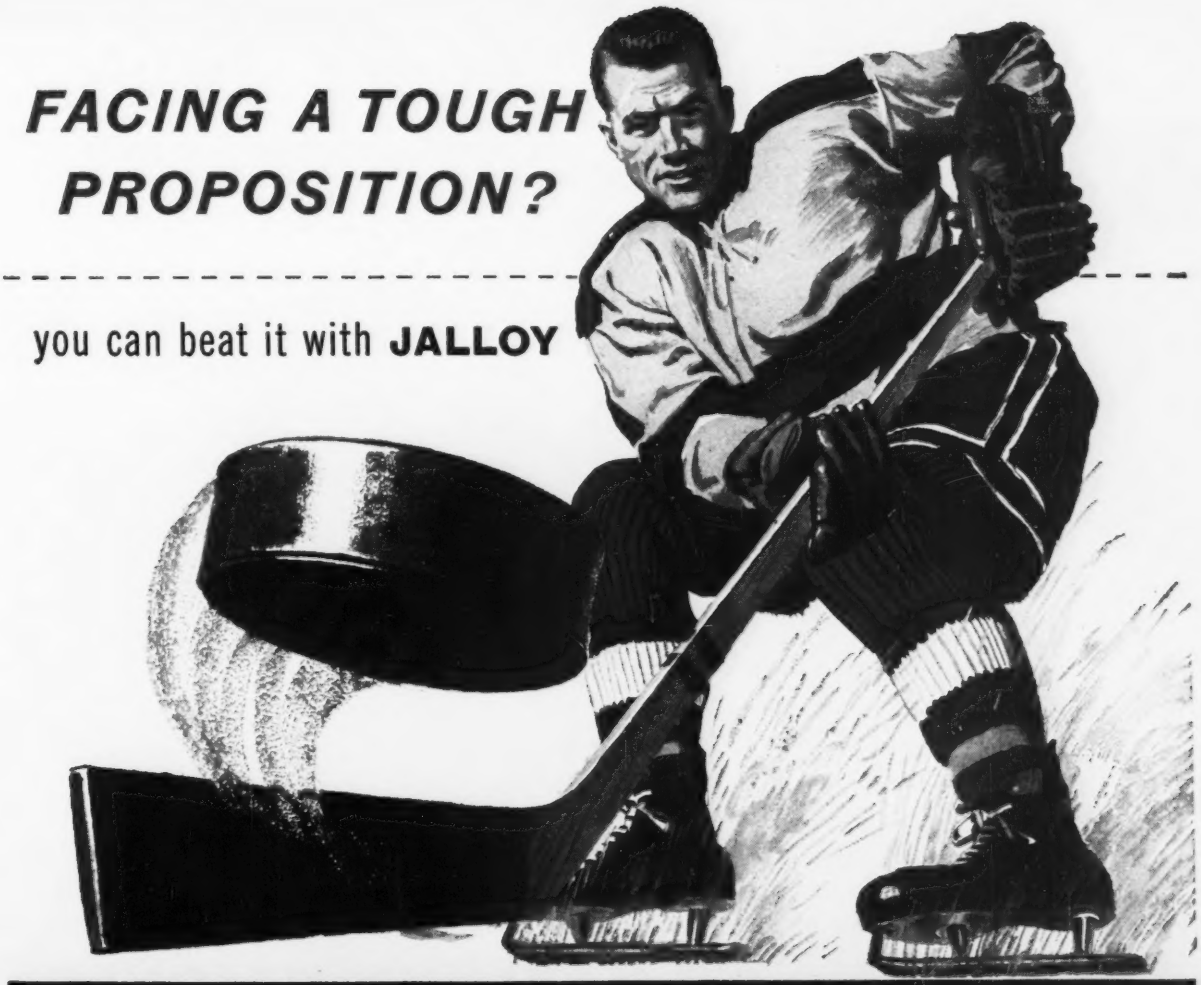
Add up all the advertisers and you've got a gold mine of current, on-the-job information. Yours for the reading are a wealth of data and facts on the very latest in products, services, tools . . . product developments, materials, processes, methods.

You, too, have a big stake in the advertising pages. Read them regularly, carefully to keep job-informed on the "with what" part of your business.

McGRAW-HILL PUBLICATIONS

FACING A TOUGH PROPOSITION?

you can beat it with **JALLOY**



J&L JALLOY HEAT-TREATED PLATE BEATS WEAR DUE TO ABRASION

J&L Jalloy Heat-Treated Plate is the general purpose steel that is heat treated to provide longer wear on applications where impact and abrasive conditions are severe.

In comparison with other abrasion-resistant steels as well as mild steels, it gives optimum results when heat treated to a Brinell hardness of 340 and up. Jalloy permits savings in steel costs, maintenance, and repair. Furthermore, it is easily welded. Jalloy is available in three grades to meet various service requirements.

Jones & Laughlin
STEEL CORPORATION — *Pittsburgh*

Complete data concerning CHEMICAL COMPOSITION . . . HEAT TREATMENT . . . WELDABILITY . . . PHYSICAL PROPERTIES . . . will be mailed to you promptly. Write today.

Jones & Laughlin Steel Corporation
3 Gateway Center, Dept. 412, Pittsburgh 30, Pa.

☐ Please mail complete data concerning Jalloy.
☐ Please have your representative call.

Name_____ Title_____

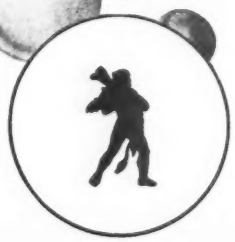
Company_____

Address_____

HERCULES®

Pine Oil

FOR MAXIMUM RECOVERY



Hercules Yarmor® F Pine Oil has been a standard of quality among flotation frothers for over thirty years. It is still unequalled for its economy, for its strength and volume of froth, texture, and cell-life stability.

This low-cost flotation agent is an excellent frother for sulfide minerals such as the zinc, copper, nickel, iron, and lead sulfides. It is widely used in the flotation of gold ores and native metals. Yarmor F is also an excellent frother for use in the beneficiation of nonsulfide ores such as coal, mica, quartz, graphite, feldspar, phosphate rock, and talc.

For technical information on Yarmor F and other Hercules flotation aids, send for 16-page booklet, "Flotation and Hercules Flotation Agents."

Naval Stores Department

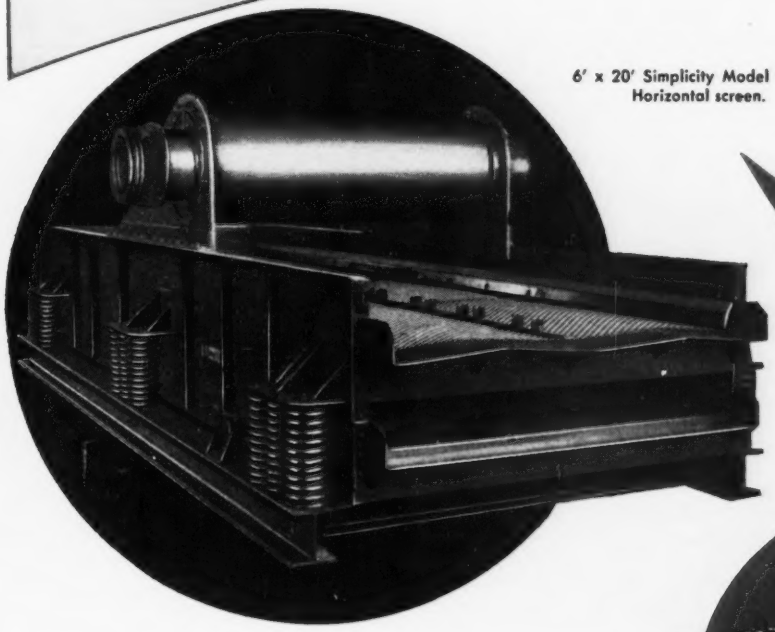
HERCULES POWDER COMPANY

INCORPORATED

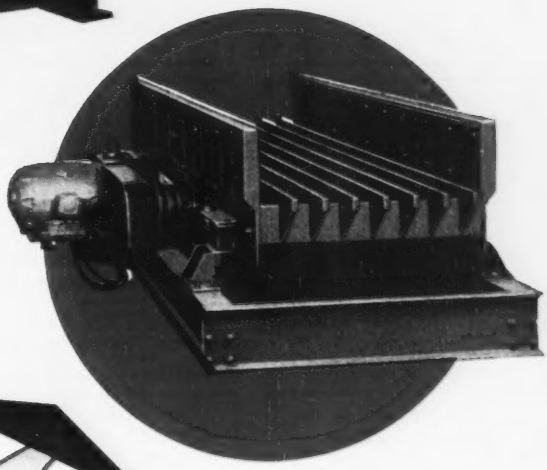
933 King Street, Wilmington 99, Delaware

NM53-1

SIMPLICITY SCREENS make short work of processing operations in metal mining



6' x 20' Simplicity Model "OM" Horizontal screen.



Simplicity Heavy Duty Scalper.

Among the many Simplicity Horizontal screens operating on the iron ranges of Minnesota and Michigan are 6' x 20' Model "OM" double deck screens like the one shown here. This unit, equipped with ⅜" opening top deck and 1½ mm. dewatering surface on the bottom deck, has been operating successfully for many years sizing and dewatering heavy media concentration iron ore fast and efficiently. Simplicity Scalpers and heavy duty Os-A-Veyor Type Feeders also play an important part in metal mining operations by speeding up processing and handling production while keeping maintenance costs at a minimum. For complete information contact a Simplicity sales engineer or write us today.

143

Simplicity
TRADE MARK REGISTERED
ENGINEERING COMPANY • DURAND, MICHIGAN

SALES REPRESENTATIVES IN ALL PARTS OF THE U.S.A.
FOR CANADA: Canadian Bridge Engineering Co., Ltd., Walkerville, Ontario
FOR EXPORT: Brown & Sites, 50 Church Street, New York 7, N.Y.

Professional Services

ASSAYING
CONSULTING
PROSPECTING
ORE TESTING

RESEARCH
METALLURGY
MILL DESIGN
MINE MANAGEMENT

BEHRE DOLBEAR & COMPANY

Consulting Mining Engineers and Geologists

11 Broadway, New York 4, N. Y.

CALL IN A SPECIALIST TO SOLVE THAT PROBLEM

Experiment takes time—so why not save time by calling in a specialist who has already gone over the ground you are now exploring?

Engineering & Mining Journal, meeting place of mining men in all parts of the country, points the way to the solution of many milling problems through its Professional Service Section.

Why not tell one of these specialists about YOUR problems?

BLANDFORD C. BURGESS
Consulting Engineer
Industrial Mineral Specialist
Appraisals Mineral Surveys
Plant Design
Prospecting Development—Efficiency
Ground Water Studies
Box 350 Monticello, Ga.

V. CLAIBORNE KILBY
Chemist
Ore Analysis
Milton N. C.

RODGERS PEALE
Consulting Mining Geologist
315 Montgomery Street
San Francisco 4, Calif.

SPANSKI and WILLIAMSON
Engineers — Geologists
Groundwater Exploration
Mineral Prospecting and Evaluation
Investigations and Reports
P.O. Box 151 Springfield, Illinois

DICKINSON LABORATORIES
Assayers—Chemists—Metallurgists—Umpire Work
Ore Shippers Representatives at Local Plants
Samplers - Analysts at Mexican Border Points
1300 West Main St. El Paso, Texas

KELLOGG KREBS
Metallurgical Engineer
Mineral Dressing Consultant
564 Market St. Telephone:
San Francisco 4, Calif. SUtter 1-6613

AMEDEE A. PEUGNET
Consulting Mining Engineer
Telephone MAin 1431
705 Chestnut St., St. Louis 1, Mo.

MARVIN J. UDY
Inorganic Chemistry Electrochemistry
Electric Furnace Smelting
Process Metallurgy
Ferro-Alloys, Calcium Carbide, Phosphorous
Telephone 2-6294
546 Portage Rd., Niagara Falls, N. Y.

GEO-RESEARCH
Geology Geophysics Mineralogy
Consultants
A Division of the Institute of Industrial Research
Syracuse 10, N.Y.. Phone: 4-6454

LEDOUX & COMPANY, Inc.
Metallurgical Chemists — Assayers
Spectroscopists
Samplers—Weighers
Representatives of Shippers of Ores and metals at Buyers Works
Office and Laboratories
359 Alfred Ave., Teaneck, N. J.

ROGER V. PIERCE
Mining Engineer Specialist
Underground Mining Methods, Cost Cutting Surveys—Production Analysis
Mine Mechanization—Mine Management.
1596 Wasatch Dr., Salt Lake City, Utah

WALKER & WHITE, Inc.
Umpire, Assayers, Chemists
Shippers Representatives
409 Pearl St. New York City

ABBOT A. HANKS, INC.
ASSAYERS—CHEMISTS
Est. 1866
Spectrographic Analysis
Shippers Representative
624 Sacramento Street
San Francisco 11

ROBERT S. MAYO
Civil Engineer
Complete Equipment for Concrete Lining of Tunnels, Haulageways and Shafts. Special Equipment for Underground or Subaqueous Construction.
Lancaster, Penna.

LUCIUS PITKIN INC.
Mineralogists—Assayers
Chemists—Spectroscopists
SHIPPERS REPRESENTATIVES
Main Office—Laboratories
Pitkin Bldg.—17 Fulton St.
New York 7, N. Y.

WEISS GEOPHYSICAL CORP.
Mining geophysical surveys with aerial and ground magnetic, gravimetric, seismic, and electrical methods. Experienced crews for systematic work in any part of the world.
P. O. Box 1188
Wilmington 99, Delaware

E. LEE HEIDENREICH, JR.
Consulting Engineers
Crushing Plants Quarries
Milling Plants Plant Design
Plant Layouts Appraisals
75 Second St., Newburgh, N. Y.
9 So. Clinton St., Chicago 6, Ill.

ARNOLD H. MILLER
Consulting Engineer
General Mine, Mill and Industrial Appraisals
Plant Design, Mechanization and Improvement
Cable: "ALMIL." Tel. Cortland 7-0635
120 Broadway, New York 5

POWERS AND EVANS
Consulting Mining and Petroleum Geologists
307 Kaufman Building
Wichita — Kansas
Delmer L. Powers
David LeCount Evans
Tel. Wichita 4-7429

HARRY J. WOLF
Mining and Consulting Engineer
Examinations — Valuations — Management
420 Madison Avenue
New York 17, N. Y.
Cable: MINEWOLF
Tel.: Plaza 9-1700

HERON ENGINEERING CO.
Consulting Engineers for all types of Aerial Tramways, Cableways, and Suspension Structures
2000 South Acoma St.
Denver 19, Colorado

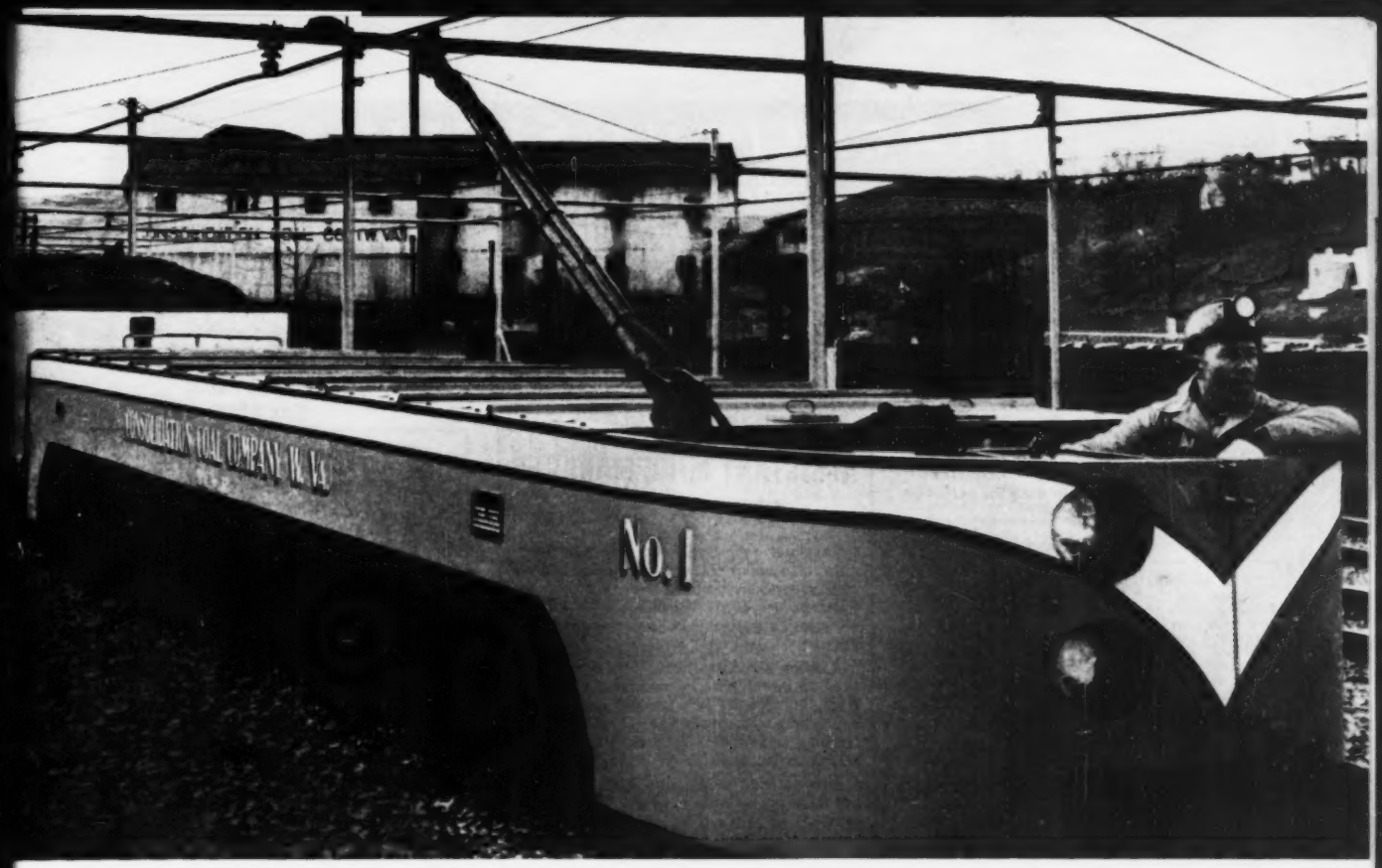
ARTHUR NOTMAN
Consulting Mining Engineer
55 Liberty St., 18th Floor
New York 5, N. Y., U.S.A.
Telephone BArclay 7-9484

SMITH-EMERY CO.
Assayers and Chemists
SPECTROGRAPHIC ANALYSES
781 E. Washington Blvd.
Los Angeles 21, Calif.

WORLD MINING CONSULTANTS, INC.
Consulting Mining Engineers and Geologists
320 Broadway, New York 38, N. Y.
Worth 2-2934

Profitable Mine Operation—

calls for operating efficiency all along the line. These specialists in various phases of mine operation can aid you materially in determining quick, economical solutions to your mining problems that make for more efficient operations, resulting in lower costs and a consequent greater return on your investment. Consult them!



G-E swivel-truck locomotives give high efficiency with high speeds and improved operator protection

Mine operators, constantly alert for new ways to speed up their present haulage to obtain increased output and reduce operating costs, approve the sturdy, powerful G-E swivel-truck locomotive. This high-speed, four-axle locomotive cuts haulage time as much as 50% to 90%, and has *safety* and operating features that are equally popular with owners and operators.

Hauls bigger loads at higher speeds

Controls on the locomotive are conveniently grouped and co-ordinated for efficient operation. Bigger loads can be started and accelerated rapidly because the smooth application of power permits operation close to the slipping point of the wheels. Equalizing action of spring suspension smooths out the ride over irregular track and lessens track wear. Because it is built to hug the rails, the locomotive can haul trains at higher speeds.

Designed for easy maintenance

There are relatively few parts on the locomotive that require daily or weekly lubrication. All points are readily accessible for quick, easy servicing. The balanced, all-welded frame is a strong, permanently-rigid structure without joints and free from bolts and rivet heads. High, rounded end frames provide maximum protection for the operator.

Built to stay on the job

The G-E swivel-truck locomotive is built for the job and stays on the job because its rugged, carefully engineered construction gives it staying power and requires little maintenance. You, like many other operators, can depend on this locomotive to bring your loads out faster day after day. **For more information, ask your G-E Apparatus Sales Office for GEA-4676. Or write General Electric Co., Section 120-66, Schenectady 5, N. Y.**

SOME OF THE MINING COMPANIES NOW USING ONE OR MORE G-E SWIVEL-TRUCK LOCOMOTIVES:

- Christopher Coal Co., Div. of Pittsburgh-Consolidation Coal Co.
- Consolidation Coal Co., Div. of Pittsburgh-Consolidation Coal Co.
- Mathies Coal Co.
- Jamison Coal & Coke Co.
- Semet-Solvay Div., Allied Chemical & Dye Corp.
- Tennessee Coal & Iron Div., U.S. Steel Corp.
- Truax-Traer Coal Co
- United States Potash Co.
- Wairton Coal Co., Div. of National Steel Corp.

GENERAL ELECTRIC

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE

$1.20 a line. Minimum 3 lines. To figure advance payment count 5 average words as a line. (See ¶ on Box Numbers.)
POSITION WANTED undisplayed rate is one half of above rate, payable in advance.
PROPOSALS, $1.20 cents a line an insertion.

INFORMATION:

BOX NUMBERS count one additional line in undisplayed ads.
DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).
EQUIPMENT WANTED OR FOR SALE Advertisements acceptable only in Displayed Style.

DISPLAYED RATE

The advertising rate is $12.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.

Send NEW ADVERTISEMENTS to N. Y. Office, 330 W. 42nd St., N. Y. 36, N. Y. For March Issue closing February 19th.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

MINE SUPERINTENDENT—Applications are invited for the post of mine superintendent at Kilembe Mine. Applicants must be mining graduates with extensive experience in control of underground operations including cut and fill, sub level and glory-hole mining methods. Production rate 1400 tons per day. Knowledge of African labour is highly desirable. Salary dependent on qualifications and experience. Applications stating full details of experience and salary expected to the General Manager, Kilembe Mines Ltd., P.O. Kilembe, Uganda.

METALLURGIST, YOUNG, graduate, preferably with some experience in non-metallic floatation. Duties to include direction of control laboratory, test work and operating metallurgy. Salary open, location—South. P-1372, Engineering and Mining Journal.

MECHANICAL - ELECTRICAL Superintendent for large base metal operation in South Africa. Successful applicant must be well versed in operation maintenance, steam power plant, mine and mill plant treating 50,000 tons per month. Three year contract. Transportation self and family, and salary while traveling. Climate and living conditions excellent. P-1509, Engineering & Mining Journal.

HYDROMETALLURGICAL ENGINEER Wanted: for position in rapidly expanding long range program. Experience in process development, design, operation and administration desirable. Ability to deal with people important. Starting salary $8360 to $9360. Write: U.S. Atomic Energy Commission, Grand Junction, Colorado.

POSITIONS WANTED

MGR.: GENL., Supt.; Dir. Research; mine exam. 58. S.B. Min. Eng. & Geol.; S.M. Process Met.; Sc.D Process & Physical Metallurgy. Labor experience North and South America. Bilingual Spanish. Ample experience Geol., Min., Mill., Smelt., Eng. Adm., Railroads, Min. Exam., Constr., modern equipment. Excellent health. Married, no small children. Available immediately. Correspondence invited. PW-9924, Engineering & Mining Journal.

MECHANICAL ENGINEER desires foreign employment in Europe or Latin America. Age 35, married, one child. Previous Latin American experience. Spanish speaking. Fifteen years heavy experience in power, mining, construction. Presently employed by large construction firm. Available on short notice. Excellent references. Inquiries invited. PW-9791, Engineering & Mining Journal.

MINING ENGINEER, graduate, 46, family, extensive experience surveying and mapping, field and office. Want responsible position similar nature, permanent surface operations, mining or other. Now employed, available reasonable notice. PW-1249, Engineering & Mining Journal.

MINING ENGINEER, E.M. degree, 30 years experience on domestic and foregin mine examinations, management and underground operations. PW-1205, Engineering & Mining Journal.

WANTED—STEADY job as Mechanic and Welder experienced in heavy road and mining machinery. Age 45, good health, married. Colo., Wyo., Nebr., preferred. Howard Mahin, Mankato, Kans.

ASSISTANT MINE MANAGER
OPEN PIT MINE

Excellent opportunity for a forceful energetic man under 45, who has held a responsible supervisory position in open pit mining. Must be a graduate engineer with at least 10 years' experience in large tonnage production.

Position requires the ability and experience to direct mine engineering, pit operations, equipment and facility maintenance and camp administration. Experience in crushing and milling is desirable. Must be willing to locate in South West desert area.

This position with large stable organization offers good salary, liberal benefits and inexpensive housing. Reply, giving personal history, education, experience and salary required. All replies will be confidential.

P1450 Engineering & Mining Journal
1111 Wilshire Blvd., Los Angeles 17, Calif.

MINING ENGINEER—Superintendent, 34, married, wants responsible position with progressive company. Experience in all phases underground mining. Available immediately. Reply Box PW-1396, Engineering & Mining Journal.

BUSINESS OPPORTUNITIES

For Lease copper-gold mine DMEA approved. 21 patented claims. 12 million production. Shipping ore in sight, equipment lacking. Large mill grade potential. Write C. F. Williams, 110 Camino Pena, Santa Fe, N. M.

Imobiliaria Dolabella Portella, Ltda., 113 Rua do Rosario (Sala 505), Rio de Janeiro, Brazil, desires partnership with American capital and know-how to explore the diamond and quartz deposits existing in a large estate it owns in the Brazilian state of Minas Gerais.

Scheelite property for sale. Rail and highway transportation available, unlimited water supply, less than mile to high voltage electric power line. Exceptionally high tungsten content of ore. Will consider substantial cash payment plus reasonable overriding royalty. Located in the Pacific Northwest. BO-1516, Engineering & Mining Journal.

We Specialize in Buying Complete Mining, Milling or Construction Plants
We have purchased 14 within three years. Please contact us before you sell.
BO 5701 Engineering & Mining Journal
520 N. Michigan Ave., Chicago 11, Ill.

WANTED
INDUSTRIAL PLANTS
Will arrange thru purchase of (1) capital stock, (2) Assets, (3) Machinery and equipment, whole or in part—Personnel usually retained, strict confidence. Box 1351 Church Street Station, New York 8, N. Y.

200 miles per hour at your convenience in your own office

You can easily go 500-600 miles in only two or three hours in roomy comfort, any time during the business day, direct to any airport, without concern for public transit schedules, routes, connections, reservations, or cancellation—and be home by dinner.
Make your travels refreshing, pleasurable assets, instead of tiring, time wasting liabilities. Write today to

REMMERT-WERNER, Inc.
Lambert Field • St. Louis 21, Mo.
EXECUTIVE AIRCRAFT

FOR SALE

Placer Mining Property — 7 claims, (3 patented, 4 unpatented at present). In proven rich area, ample water supply for sluicing or hydraulic. Easy accessibility, right on good road. Price: $150,000—consider $50,000 cash, balance arranged. Contact: President,

United Mining & Metals Corp.
1524 S. E. 43rd Ave., Portland 15, Oregon

Your inquiry will have special value . . .

if you mention this magazine, when writing advertisers. Naturally, the publisher will appreciate it . . . but, more important, it will identify you as one of the men the advertiser wants to reach with this message . . . and help to make possible enlarged future service to you as a reader.

SINCE 1898 DEPENDABLE RECONDITIONED MACHINERY

HOISTS—ELECTRIC

1—10 HP Vulcan #0 Single Drum
1—15 HP Morse New Single Drum
1—20 HP H&B Single Drum
1—22 HP Vulcan Single Drum #1½
1—30 HP Vulcan, Double Drum
1—30 HP Vulcan Single Drum
1—37 HP Single Drum
2—52 HP Vulcan #4½ Single Drum
1—50 HP Fairbanks-Morse Single Drum
1—60 HP H&B Single Drum
1—60 HP Vulcan #23ELF Single Drum
4—100 HP Box Single Drum
1—112 HP Vulcan Single Drum
2—150 HP Vulcan Single Drum
1—350 HP Dillon-Box Single Drum
1—600 HP Box Single Drum
1—22 HP Vulcan #1½ Double Drum
1—60 HP Ottumwa Double Drum
1—40 HP American 3 Drum
1—80 HP Thomas 3 Drum
1—80 HP Lidgerwood
1—80 HP Clyde 3 Drum

FILTERS

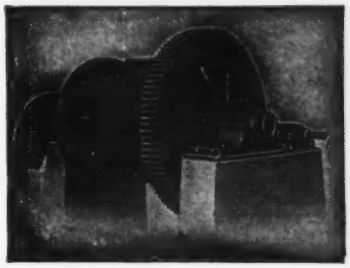
1—6' 2-disc American Filter
1—6' 3-disc American Filter
1—18" Morse Round Paterson Filter Press
1—36" Merrill Triangular Filter Press
1—#12 Sweetland Filter Press, 38 leaves

FLOTATION MACHINES

1—New Morse Jetair 2 cell #7
1—29 x 7 Fagergren Single Cell
1—6 cell 18" Stearns-Roger
2—6 cell Denver "Sub A" #21
1—New Morse Jetair 6 Cell #36

PORTABLE COMPRESSORS

1—105 CFM Ingersoll Rand Portable Driven by 4 Cylinder Gasoline Engine
1—210 Worthington "Blue-Brute" Portable Driven by Continental 6 Cylinder Gasoline Engine
1—240 CFM Schramm Portable Driven by Buda 4 Cylinder Gasoline Engine
2—315 CFM Gardner Denver Driven by Buda 4 Cylinder Gasoline Engine
1—310 CFM Sullivan driven by Buda 4 Cylinder Gasoline Engine



BALL & ROD MILLS

1—4' x 3' Marcy Ball Mill
1—4' x 3' Morse Ball Mill
2—6' x 48" Hardinge Conical Ball Mills with air sweet equipment.
1—8' x 22" Hardinge Conical Pebble Mill
1—3' x 8' Marcy Rod Mill

DIAPHRAGM PUMPS

3—2" New Morse Diaphragm Pumps
2—4" New Morse Diaphragm Pumps
1—2" Dorrco Duplex Pump
1—4" Barnes Pump
1—4" Dorrco Duplex Pump
2—4" Butchart Pumps
1—4" Dorrco Pressure Diaphragm Pump

DRYERS

1—3' x 18' Bartlett & Snow Rotary Dryer
1—5' x 40' Dryer
1—6' x 75' Rotary Kiln
1—7'6" x 125' Messer Rotary Kiln

LOCOMOTIVES

1—2-2½ ton Whitcomb Battery, 24" gauge
1—2½ ton Jeffrey battery or trolley, 36" gauge
1—3½ ton Mancha battery, 25" gauge, with 2 sets Edison batteries and charging set
1—3½ ton Mancha battery, 24" gauge
1—4 ton Westinghouse battery, 24" gauge
1—4 ton Ironton battery, 36" gauge
2—7 ton General Electric permissible battery, 36" gauge
1—7 ton Atlas battery, 36" gauge
3—8 ton Ironton battery, 36" gauge
2—8 ton General Electric battery, 36" gauge
4—10 ton Atlas battery, 36" gauge
1—10 ton Atlas battery, 36" gauge
1—4½ ton Goodman trolley, 36" gauge
1—5 ton Jeffrey trolley, 36" gauge
3—8 ton Ironton battery, 36" gauge
2—8 ton Goodman trolley, 36" gauge

CRUSHERS

4—2½" x 3½" New Morse Lab Jaw Crushers
5—4" x 6" New Morse Lab Jaw Crushers
1—9" x 14" Universal Jaw Crushers
1—9" x 15" Wheeling Jaw Crusher
1—9" x 15" Farrell Jaw Crusher
1—9" x 18" Universal Jaw Crusher
1—8" x 24" Rogers Jaw Crusher
1—8" x 36" Universal Jaw Crusher
1—11" x 18" Universal Jaw Crusher
1—24" x 13" Farrell Jaw Crusher
1—10" x 16" Hercules Jaw Crusher
1—36" x 48" Jeffrey Flextooth Crusher
1—26" x 18" Williams Hammermill
1—30" x 17" Williams Hammermill

RAIL

We have in stock good relaying rail, 16# to 90# also new 16# to 28# with fittings.

Send for Catalog 521E

MORSE BROS. MACHINERY COMPANY

2900 Brighton Blvd. P.O. Box 1708 Keystone 5261 DENVER, COLORADO

MOTOR GENERATOR SETS

1—600 KW GE Syn. 275 V. DC, 900 RPM
2—300 KW GE Syn. 275 V. DC, 1200 RPM
2—300 KW WEST. Syn. 275 V. DC, 1200 RPM
2—200 KW GE Syn. 275 V. DC, 1200 RPM
2—150 KW GE Syn. 275 V. DC, 1200 RPM

LOCOMOTIVES

1—13 T JEFFREY 250 V. MH-110 32-44" Ga.
2—10 T JEFFREY 250 V. MH-110 32-48" Ga.
1— 8 T WEST. 250 V. ML-925-LK 24-28½"
2— 8 T WEST. 250 V. ML-905-C 24-36" Ga.
2— 8 T JEFFREY 250 V. MH-100 32-36" Ga.
1— 5 T WEST. 250 V. ML-903-C 24-36" Ga.
2— 4 T GE 250 V. HM-825-A 30-36" Ga.
2— 4 T WEST. 250 V. ML-901-C 18-44" Ga.

WALLACE E. KIRK COMPANY
505 Grant Building, Pittsburgh 19, Penna.

PIPE

SURPLUS NEW and USED FOR SALE

A.G.

DIESEL ENGINES • GENERATOR SETS
10 TO 2000 KW • AC&DC • GUARANTEED
SCHOONMAKER CO., INC.
90 CHURCH ST. NEW YORK 7, N.Y.
Plants: SAUSALITO (S.F.) CAL., JERSEY CITY, N.J.

WANTED
ROTARY KILN

3'6" — 6' INTERNAL DIAMETER, 12 — 30' LONG.

H. A. BRASSERT & COMPANY
60 East 42 St., N.Y. 17. MU 2-1720

If there is anything you want

or something you don't want that readers can supply—or use—*advertise it in the*

Searchlight Section

SAVINGS FLOW

FROM **SPEED-LAY** PIPE SYSTEM

EVERYTHING FOR A COMPLETE PORTABLE PIPE SYSTEM

FACTORY PACKAGED
PIPE COUPLINGS—FITTINGS
VALVES—ACCESSORIES
LIGHTWEIGHT, LABOR SAVING
immediate installation
by one unskilled man. 2½ to 30 o. d. black or galvanized. Ready to lay—without delay.

Complete inventory of all Industrial Pipe, Valves, Fittings, and Flanges.

FOR SALE OR RENT

DELIVERED READY FOR INSTALLATION

SPECIALISTS IN PREFABRICATED PIPING

ALBERT
PIPE SUPPLY CO., INC.
Berry at North 13th St.
Brooklyn 11, N. Y.
Phone EVergreen 7-8100

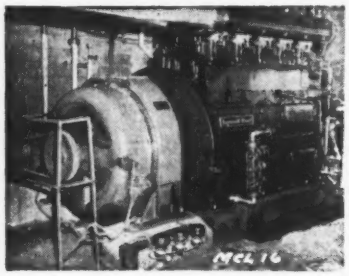
SEND COUPON NOW!

ALBERT PIPE SUPPLY CO., INC.
Berry at N. 13th St., Brooklyn 11, N. Y.
Please send free booklet describing your Speed-Lay System and services.

NAME .....
FIRM NAME .....
ADDRESS .....
CITY ..... STATE .....

185 KW DIESEL GENERATING UNIT

480 V. 3 ph, 60 cycle



Intermediate Speed—Like New

Engine: Ingersoll-Rand Type S, 273 BHP 720 rpm, air starting, 5 cyl, 1946 model.

Accessories: Woodward Governor, oil & fuel filters, water pumps, fuel & water tanks heat exchangers, starting equip.

Generator: Elliott 231 KVA, 185 KW, 480 v. 3 ph, 60 cycle, .8 pf, with 5 KW exitor.

Also includes panel board, piping, extra parts and tools.

Write for complete specifications and price.

MACHINERY CENTER, INC.

Formerly: Roger Pierce Equipment Sales Co.

808 Newhouse Building

Salt Lake City, Utah

LOCOMOTIVES: 2—65 ton diesel electric, standard R.R. gauge, thoroughly modern, excellent condition. For sale or rent.

JAW CRUSHERS: Telsmith 18 x 32", all steel, roller bearing equipped, NEW condition, with or without 50 H.P. motor, 440 volt, V-belt drive. Other Crushers 12" x 15" to 48" x 60".

CLASSIFIERS: 4—Akins 54" x 34 ft. with lifting device, 220/440 volt motors. 2—Wemco 78" Simplex single screw, double pitch, 28½ ft. tank, 220/440 volt motors. All in condition like NEW. 1—Wemco Duplex size 72" x 32 ft., type SH, pitch double and variable, with lifting device, 220/440 volt motor. NEW and UNUSED. Three located Nevada.

PULVERIZERS: 1—Hardinge 10' x 36", one 10' x 48" and one 5' x 22" Conical Ball Mills, complete with motors, drives and auxiliary equipment for dry grinding. 1—NEW 9'6" x 11 ft. Ball Mill with or without NEW 700 H.P. synchronous motor, 180 RPM, 3 phase, 60 cycle, complete with incher control. NEW, UNUSED. 1—8' x 12' Marcy Mill.

LOCOMOTIVE CRANE: Link Belt 25 ton capacity, standard R.R. gauge, gasoline powered, cast steel trucks, air brakes, with or without 1¼ yd. Williams clam shell bucket, thoroughly modern, excellent condition, located Minnesota.

MINE HOISTS: Single and double drum 100 to 1500 H.P. with all electrical equipment. Complete specifications, drawings and photos available.

WE BUY AND SELL EQUIPMENT THROUGHOUT NORTH AND CENTRAL AMERICA

A. J. O'NEILL

Lansdowne, Pa.

Phila. Phones: MAdison 3-8300—3-8301

EQUIPMENT

LATEST TYPE METALLURGICAL AND CHEMICAL EQUIPMENT EXCELLENT CONDITION

Hardinge Conical Ball Mill 10' x 48"
Oliver All Iron Rotary Vacuum Filters
Buflovak Twin Drum Dryer
Dorr Type A Thickeners
Allis-Chalmers type 222 Gyratory Crusher
Link Belt Screw & Belt Conveyors
Norblo & Sly Dust Collectors
Dorr, Morris, Worthington process pumps
Research Corp. Electrostatic Precipitator

The above items include all auxiliary equipment with individual motor and control 220/440/3/60. The equipment may be inspected on foundations.

Complete List with Specifications Available.

The VULCAN DETINNING CO.

SEWAREN, N. J.

FOR SALE

2—All steel 5' x 8' x 65' high shaft head frames with 60" Bicycle sheeves, bearings, crossheads, shaft buckets, and complete 24" gauge tunnel driving and lining equipment.

TARLTON CONTRACTING CO.

West Park at Manchester Ave., St. Louis 10, Mo.

RELAYING RAIL

All Sizes

Track Accessories

LEFTON INDUSTRIAL CORP.

***Genl. Office:* 212 Victor St.**

St. Louis 4, Mo.

ELECTRICAL WIRE AND CABLE

YOUR BEST SOURCE . . .

- for every industrial and power application
- odd lengths—long and short—reasonably priced
- largest stock in Midwest
- varnished cambric—leaded—neoprene

Let us quote on requirements—send your inquiries

DELIVERY

QUICK . . . from stock

We'll also buy your Surplus

Branch Offices:
Houston—Yukon 5547
Los Angeles—DUnkirk 7-3265

UNIVERSAL Wire and Cable Co.

2984 N. Clybourn Ave., Chicago 14, Ill.
EAstgate 7-4777 Code: UNIWIRE

36-42-60 IN. NEW BELT CONVEYOR EQUIPMENT IN STOCK

5000 — CONVEYOR CO. BALL BEARING 6 In. and 5 In. dia. Idlers Troughing Type 60 In. $35. ea.; 42 In. $20. ea.; 36 In. $18.50 ea. Return Type 60 In. $15. ea.; 42 In. $11.50 ea.; 36 In. $11 ea. Also 3 complete terminals and drives. 5000 ft. 36 In. & 42 In. Belt.

35 COMPLETE NEW TERMINALS FOR ABOVE AT VERY LOW PRICES.

DARIEN CORP., 60 E. 42nd St., New York 17, N. Y. • MU-2-0042

At Your Service

— for bringing business needs or "opportunities" to the attention of men associated in executive, management, sales and responsible technical, engineering and operating capacities with the industries served by the following McGraw-Hill publications:

The SEARCHLIGHT SECTIONS of

(Classified Advertising)

American Machinist
Aviation Week
Business Week
Bus Transportation
Chemical Engineering
Chemical Week
Coal Age
Construction Methods & Equipment
Electrical Construction & Maintenance
Electrical Merchandising
Electrical Wholesaling
Electrical World
Electronics
Engineering and Mining Journal
E. & M. J. Metals & Mineral Markets
Engineering News-Record
Factory Management and Maintenance
Fleet Owner
Food Engineering
National Petroleum News
Nucleonics
Petroleum Processing
Power
Product Engineering
Textile World
Welding Engineer

For advertising rates or other information address the

Classified Advertising Division

McGRAW-HILL PUBLISHING CO., Inc.

330 West 42nd Street

New York 36, N. Y.

FOR SALE

2—Sutton, Type ORE, Model B-100 Air-float Separators.
1—4¼ x 5, Six Cyl. Wisc. Gas Power Unit, Appx. 65 H.P.
1—14" x 50' long belt conveyor, mt'd. on steel channels—Motorized.
1—3" Wilfley Sand Pump
1—12" x 5" Denver Batch Ball Mill
1—Massco Auto. Density Controller
1—6½' x 5' Conditioner—Steel Tank
2—Agitator Mechanisms for 8' x 10 Tanks.
1—6 x 12 Wheeling Jaw Crusher
1—3" Dorrco Duplex Diap. Pump—Motorized
2—Adams Wet Reagent Feeders
1—Size G-8 I.R. Pedestal Air Grinder
1—18" Dings Magnetic Pulley, complete with Mech., belt and charger
Motor Mt'd. Cent. Pumps—Deep Well Pumps Motors—¼ H.P. to 50 H.P.

Write for Stock List No. 12

Florence Machinery & Supply Co.
904 Equitable Bldg., Denver 2, Colo.

1—800, 1100 & 1500 Barrel Cement Plants—Complete lime hydrating plant
Rotary Dryers—4' x 30', 6' x 40', 5' x 50'.
Tube & Ball Mills—6' x 9'—5' x 22'—5½' x 20'.
6' x 100'—7' x 120' & 8' x 150' Modern Kilns.
Jaw Crushers—From 10" x 6" up to 48" x 60".
Crushing Rolls—From 12" x 24" up to 54" x 24".
Sturtevant Rotary fine crushers—No. 0—No. 2—7 x 7—6 x 12 & 8 x 6 Ball Mills.
1—6' x 22' Harding Ball Mill.
Ring Roll Mills—Sturtevant No. 1—No. 2 duplex.
5'—16' & 18' Hereschoff furnaces.
Gyratory crushers, No. 3 to No. 12.
222—322 & 236 Allis-Chalmers Hydrocone Crushers
Magnetic separators—Jigs—screens—classifiers, thickeners, air separators & filters.
4'—5'—6' & 7' dia. Rod Mills.
New Dryers—Kilns, Dust Collectors & Slime Hydrators.
6'—10"—14"—16" McCully Superior gyratory crushers.

W. P. Heineken, Inc.
50 Broad Street, New York

Practically New
12 lb. Rails
12 & 15 foot lengths
Also heavier sections
Relaying Rails
Tie Plates for all sizes rail available.

Write — Wire — Phone

SONKEN-GALAMBA CORPORATION
2nd and Riverview (X-118)
Kansas City 18, Kansas
ATwater 9305

MACHINERY

Jig: Bendelari 42x42 duplex
Jig: Bendelari 42x42 simplex
Sand Pumps: 2 to 4" Wilfleys
Flotation: 4-Cell 38x38 Sub-A

PAUL F. SMITH
39 W. Adams St. — Phoenix, Arizona

Walking draglines, 3 to 14 yds., diesel-elec.
Shovels, cranes, dragls., 1½ to 18 yds. (15).
Locomotives, diesel, gas, 7 to 80 tons (10).
B-Erie 42-T blast hole drills (3), elec., 9".
Euclid 23-ton bottom dumps, diesel (3).
Cat DW-10 diesel bottom dump wagons (3).
Diesel-elec. generator sets, 1000, 700 KW.
Rotary kilns, dryers, 7'x125', 54"x40', 6x80.
Telsmith 26" steel gyratory rock crusher.

H. Y. SMITH CO., 828 N. B'way, Milw. 2, Wis.

JACKBITS — FOR SALE

Timken Type "H", "M" and "O" — Ingersoll-Rand Type "0", "1" and "2", side and center hole, all sizes. Less than distributors buying price. Packed for export if required.

JULIUS M. FOGELMAN
1649 Perkiomen Ave., Reading, Penna.

FOR QUICK, DEPENDABLE

COMPRESSOR SERVICE

AMERICAN AIR of JERSEY

GAS • DIESEL • STEAM • ELECTRIC

SELL—BUY—TRADE—RENT—REPAIR

A RENTAL COMPRESSOR FOR EVERY JOB

55 CFM Lindsay (GAS) Portable
60 CFM Worthington (GAS) Portable
70 CFM Smith (GAS) Portable
89 CFM 6 x 7 Worthington HB, 15 HP Elec
105 CFM Worth-IR-CPT Portable
107 CFM 7-7 x 7 Ingersoll FS-1 STEAM
129 CFM 7½ x 7 American AF-1, 20 HP
142 CFM Ingersoll Semi-Portable 25 HP
160 CFM IR-Worth Portable
165 CFM Smith 110SR Semi-Portable, 25 HP
195 CFM 8-9 x 9 Worthington HS STEAM
210 CFM Worthington (GAS or DIESEL) Port
211 CFM 9 x 9 Worthington HB, 40 HP Elec
279 CFM 11-10 x 11 Worthington HS STEAM
294 CFM 10 x 12 Worthington HB, 50 HP
315 CFM Worthington (GAS or DIESEL) Port
387 CFM Gardner Semi-Portable 75 HP
445 CFM Gardner Semi-Portable 100 HP
462 CFM 12-14½x13 American AF-S STEAM
500 CFM Worthington (DIESEL) Portable
538 CFM Worthington Semi-Portable, 100 HP
600 CFM Worthington (DIESEL) Portable
628 CFM 14 x 13 Ingersoll ES-1, 100 HP

MANY OTHERS TO CHOOSE FROM
GUARANTEED PERFORMANCE
COMPRESSORS SINCE 1902

American
AIR COMPRESSOR CORP.
47th ST. & DELL AVE. NORTH BERGEN, N. J.
Telephone UNion 5-4848

---

5 SURPLUS MERRICK E WEIGHTOMETERS
For 18", 24", 30", 36" & 42" Belts
CRUSHERS
JAW: 48x60, 42x48, 30x36, 24x36, & 30x42
REDUCTION: 1'8" & 3' TRAYLOR TY
322 & 636 R ALLIS CHALMERS
GRINDING MILLS
TUBE MILLS: 5'x18', 5'x22', 5½'x20' & 6'x22'
BALL MILLS: 5x4, 6x6, 6x12, 7x6 & 9½x11
HARDINGE: 5'x22", 6'x22", 8'x22", 10'x36" & 10'x48"
ROD MILLS: 4'x7', 5'x14' & 3'x10'
CLASSIFIERS & THICKENERS, ETC.
DINGS MAGNETIC: Type 1-R—3 STAGE—60"
DORR 40' D.x30'—3 TRAY, 4 COMP. THICKENER
STANDARD THICKENERS: 12' to 100' dia.
DORR CLASSIFIERS: 3'x25'x10' Turret Bowl
6x22 DSF, 2x15 SSFR
54", 60" & 78" Wemco Spirals
12'x10' DORRCO DRUM FILTER
8 DISC 8'6" AMERICAN AND OTHER FILTERS
AIR COMPRESSORS
9 Electric 5,000, 3,865, 3,178, 2,200, 1,578 & 1,302, 1,090, 678 & 500 Ft.
6 Diesel 1,578, 1,000, 676 & 500 Ft.
LOCOMOTIVES
8 Goodman 4 ton — 8 ton Battery Locomotives.
12 Diesel 100, 80, 65, 45, 30, 20 Ton Locomotives.
22 Gas, 35, 25, 16, 12, 8 & 6 Ton Locomotives.
7 4 ton, 6 ton, 13 ton Trolley.
R. R. CARS
100 Dump Cars, 2, 4, 12, 20 and 30 yd.
100—60 Ton Flat Cars. 66—50 Ton Gondolas.
150—8,000 & 10,000 Gal. Cap. Tank Cars
TUNNEL MUCKERS — LOADERS
4 Gardner Denver GD9 & GD14.
10 Elmco 40 & 12B & 21, 4 Sullivan HL20.
CRANES
30 Ton Ind. B.H. 70 Ft. Boom Loco. Crane, Gas.
3—802 & 1201 Lima Comb. Cranes & Draglines.
SECTIONAL FRAME CRUSHERS.
2 Buchanan MODEL C 30 x 42
MISCELLANEOUS
Rotary Dryers: 4x20, 4'x40', 6'x40' & 6'x60'.
Kilns: 4'x28', 6'x60', 7'x60', 8'x72' & 8'x125'.
Mine Hoists: 75, 200, 300, 400, 600 & 1300 H.P.
40—10,000 Gal. R.R. Car Tanks.
Hercules Junior 3 Roll Pulverizer.
36x24 Jeffrey B2 Pulverizer & 36x36 B-3.
7—20,000 Gal. Steel Storage Tanks.

R. C. STANHOPE, INC.
60 E. 42nd St., New York 17, N. Y.

WORLD'S LARGEST INVENTORY

FREE CATALOG

MOTORS—GENERATORS—TRANSFORMERS
New and Guaranteed Rebuilt
1 H.P. to 2500 H.P.

ELECTRIC EQUIPMENT CO.
P. O. BOX 51, ROCHESTER 1, N.Y.

CARLYLE
INDUSTRIAL RUBBER PRODUCTS FOR EVERY PURPOSE

IMMEDIATE DELIVERY OF CONVEYOR, ELEVATOR AND TRANSMISSION BELTING — FIRE, WATER, SUCTION, AIR, STEAM AND WELDING HOSE

WHY WAIT

We have 8 to 48 RUBBER CONVEYOR BELTING

TOUGHCOVERS—Heavy duty, specially compounded abrasive resistant rubber covers having high tensile strength. Thoroughly capable of withstanding the abrasive action of bulk materials. Properly vulcanized to the carcass to assure utmost performance, economically.
STRONG CARCASS—Constructed of finest quality 28 and 32 ounce tough cotton duck, properly treated and impregnated to avoid mildew from moisture and atmospheric conditions. Each ply thoroughly embedded in rubber to prevent ply separation.
FLEXIBILITY — Careful attention has been given in the construction of all belts to have the proper flexibility assuring the following desirable features: troughs easily runs true on all idlers, gauge resistant, excellent for long and short hauls and slope installations.

Avoid delays in your production schedule!

We carry in stock for your immediate requirements, Conveyor Belting in widths from 8 inches to 48 inches

Width	Ply	Thickness Top Cover	Thickness Bottom Cover	Type of Duck Carcass
8"	4	1/16"	1/32"	28 Oz.
10"	4	1/16"	1/32"	28 Oz.
12"	4	1/16"	1/32"	28 Oz.
14"	4	1/16"	1/32"	28 Oz.
16"	4	1/8"	1/32"	28 Oz.
18"	4	1/8"	1/32"	28 Oz.
20"	4	1/8"	1/32"	28 Oz.
20"	5	1/8"	1/32"	28 Oz.
24"	4	1/8"	1/32"	28 Oz.
24"	5	1/8"	1/32"	28 Oz.
26"	5	1/8"	1/32"	28 Oz.
30"	4	1/8"	1/16"	32 Oz.
30"	5	1/8"	1/16"	32 Oz.
30"	6	1/8"	1/16"	32 Oz.
36"	6	1/8"	1/16"	32 Oz.
42"	5	1/8"	1/16"	32 Oz.
48"	5	1/8"	1/16"	32 Oz.
48"	8	1/8"	1/16"	32 Oz.

INQUIRE FOR SIZES NOT LISTED. ELEVATOR TRANSMISSION & V-BELTING ALSO IN STOCK.

All our belting made by the leading belting manufacturers.

Write for Free Booklet on Installation, Care & Maintenance of Conveyor Belting.
SEND US YOUR INQUIRIES FOR OTHER RUBBER PRODUCTS

CARLYLE RUBBER CO., Inc.
62-66 Park Place, New York 7, N. Y.
Phone: Digby 9-3810

FLUID DRIVE · GYROL TYPE VS HYDRAULIC COUPLINGS

Stepless speed variation with constant speed prime mover made by American Blower Co. Ideal for pumping stations, steel mill drives, mechanical draft fans, crushers, rotary kilns, etc. Wide range of capacities—Condition 98% new

200 HP to 2500 HP Input
300 RPM to 900 RPM Input

Complete data & quotation on request

Also large selection of marine couplings, reduction gears, & Falk grid type couplings in stock.

A. G. SCHOONMAKER CO., INC.
50 CHURCH ST., NEW YORK 7, N. Y.

ALPHABETICAL INDEX TO ADVERTISERS

(This index is published as a convenience to the reader. Every care is taken to make it accurate, but E&MJ assumes no responsibility for errors or omissions.)

Acker Drill Co. ... 206
Aero Service Corp. ... 56, 188
Allen-Sherman-Hoff Pump Co. ... Second Cover
Allis-Chalmers Mfg. Co. (General Machinery) ... 40, 62
Allis-Chalmers Mfg. Co. (Tractor Div.) ... 8, 9, 63
Allison Div. General Motors ... 48, 49
American Air Filter Co., Inc. ... 228
American Brattice Cloth Corp. ... 211
American Cable Div. American Chain & Cable ... 177
American Cyanamid Co. ... 50A
American Foreign Insurance Assoc. ... 50B
American Manganese Steel Div. (American Brake Shoe Co.) ... 145
American Mine Door Co. ... 220
American Rubber Mfg. Co. ... 198
American Steel & Wire Div. U. S. Steel Corp. ... 10, 64, 140, 141
Anconda Wire & Cable Co. ... 60
Analytical Measurements, Inc. ... 211
Atlas Powder Co. ... 231

Baldwin-Lima-Hamilton Corp. (Car Div.) ... 223
Baldwin-Lima-Hamilton Corp. (Locomotive Div.) ... 61
Barber-Greene Co. ... 197
Bemis Bro. Bag Co. ... 205
Bethlehem Steel Co. ... 65, 221
Bin-Dicator Co. ... 248
Booth Engineers ... 250
Boyles Bros. Drilling Co. ... 139
Broderick & Bascom Rope Co. ... 171
Bucyrus-Erie Co. ... 28, 227
Builders-Providence, Inc. ... 207

C & D Batteries, Inc. ... 210
Card Iron Works Co., C. S. ... 205
Caterpillar Tractor Co. ... 42, 262
Chemical Construction Co. ... 238
Chicago Pneumatic Tool Co. ... 20
Clark Equipment Co. ... 146, 147
Cleveland Rock Drill Div. of Le Roi Co. ... 26, 27
Cleveland Vibrator Co. ... 192
Cleveland Worm & Gear Co. ... 166
Colorado Fuel & Iron Corp. ... 18, 19, 54
Columbia-Geneva Steel Div. ... 10, 55, 64, 140, 141
Companhia Vale Do Rio Doce, S. A. ... 244
Connellsville Mfg. & Mine Supply Co. ... 194
Continental Gin Co. ... 247
Crane Co. ... 32
Crucible Steel Co. of America ... 34

Dart Truck Co. ... 261
Deister Concentrator Co. ... 174
DeLong Engrg. & Const. Co. ... 202
Denver Equipment Co. ... 43
Detroit Diesel Engine Div. General Motors ... 235
Diamond Power Specialty Corp. ... 194
Differential Steel Car Co. ... 218
Dorr Co. ... 135
Dow Chemical Co. ... 222
du Pont de Nemours & Co., Inc., E. I. (Explosives Dept.) ... 229

Easton Car & Construction Co. ... 161
Eimco Corp. ... 44, 45, 50, 191
Elektrokemisk, A. S. ... 206
Engineers Syndicate ... 196
Engineering & Mining Journal ... 212, 213
Ensign-Bickford Co. ... 179

Flexible Steel Lacing Co. ... 196
Fuller Co. ... 242

Galigher Co. ... 159
Gardner-Denver Co. ... 11
Garlock Packing Co. ... 200
General Electric Co. ... 22, 23, 255
Georgia Iron Works Co. ... 149
Godoy & Co., Inc., E. A. ... 184
Goodman Mfg. Co. ... 33, 59
Goodrich Co., B. F. ... 5
Goodyear Tire & Rubber Co. ... 21
Gould-National Batteries, Inc. ... 241

Greensburg Machine Co. ... 204
Gustin-Bacon Mfg. Co. ... 176

Hammermills, Inc., Div. Pettibone Mulliken Corp. ... 182
Harbison-Walker Refractories Co. ... 162, 163
Hardinge Co. ... 186, 187
Harnischfeger Corp. ... Third Cover
Hayes Steel Products, Ltd. ... 216
Hazard Insulated Wire Works Div. Okonite Co. ... 245
Heil Co. ... 199
Hercules Powder Co. (Explosives Dept.) ... 58
Hercules Powder Co. (Naval Stores Dept.) ... 252
Hewitt-Robins, Inc. ... 152, 153
Hough Co., Frank G. ... 195
Humphreys Investment Co. ... 239

Ingersoll-Rand Co. ... 3
Irwin Foundry & Mine Car Co. ... 230

Jenkins Bros. ... 137
Johnson Co., C. A. ... 12, 13
Jones & Laughlin Steel Corp. ... 31, 251
Joy Mfg. Co. ... 16, 17, 155, 248

Kaiser Engineers Div. of Henry J. Kaiser Co. ... 39
Kennedy-Van Saun Mfg. & Engrg. Corp. ... 143
Koehring Co. ... 12, 13

Le Roi Co. ... 26, 27
LeTourneau-Westinghouse Co. ... 24, 25, 51
Link-Belt Co. ... 30
Longyear Co., E. J. ... 233
Lubriplate Div. Fiske Bros. Refining Co. ... 190

Mace Co. ... 210
Mack Trucks ... 243
Majac, Inc. ... 215
Mancha Storage Battery Locomotive Div. Goodman Mfg. Co. ... 33
McKee & Co., Arthur G. ... 189
McLanahan & Stone Corp. ... 226
Merrick Scale Mfg. Co. ... 196
Midvale Co. ... 236
Mine & Smelter Supply Co. ... 183
Morris Machine Works ... 180

Nagle Pumps, Inc. ... 207
National Filter Media Corp. ... 170
Naylor Pipe Co. ... 164
New York Engineering Co. ... 248
Nordberg Mfg. Co. ... 36
Northwest Engineering Co. ... 15

Parson Co. ... 12, 13
Pennsylvania Drilling Co. ... 248
Philadelphia Gear Works, Inc. ... 237
Precision Radiation Instruments ... 210
Pressed Steel Car Co., Inc. ... 201

Research Corp. ... 178
Roebling Sons Corp., John A. Sub. Colorado Fuel & Iron Corp. ... 54
Rollway Bearing Co., Inc. ... 249
Rust-Oleum Corp. ... 193
Ryerson & Sons, Inc., J. T. ... 204

Sanford-Day Iron Works, Inc. ... 52, 53
Santa Fe Tank & Tower Co. ... 203
Sauerman Bros., Inc. ... 167
Searchlight Section ... 256-259
Simplex Wire & Cable Corp. ... 173
Simplicity Engineering Co. ... 253
Skookum Co., Inc. ... 188
Smidth & Co., F. L. ... 246
Smit & Co., Anton ... 214
Smit & Sons, Inc., J. K. ... 165
Smith Engineering Works ... 38
Spang & Co. ... 192
Sprague & Henwood, Inc. ... 57
Standard Oil Co. of Calif. ... 14
Stearns-Roger Mfg. Co. ... 240
Stephens-Adamson Mfg. Co. ... 29
Stoody Co. ... 185
Straub Mfg. Co. ... 220
Sturtevant Mill Co. ... 225
Superior-Lidgerwood-Mundy Corp. ... 248

Tennant, Sons & Co., C. ... 214
Tennessee Coal & Iron Div. ... 10, 55, 64, 140, 141
Texas Co. ... 6, 7
Thomas Flexible Coupling Co. ... 154
Thompson Products, Ltd. ... 250
Timken-Detroit Axle Div. Rockwell Spring & Axle Co. ... 208, 209
Timken Roller Bearing Co. ... Fourth Cover, 47
Tinney Drilling Co. ... 190
Traylor Engrg. & Mfg. Co. ... 219
Twin Disc Clutch Co. ... 175

Ultra-Violet Products, Inc. ... 190
United States Rubber Co. ... 168, 169
United States Steel Corp. ... 10, 55, 64, 140, 141
United States Steel Export Corp. ... 10, 55, 64, 140, 141

Vale Do Rio Doce Trading Co. ... 244
Vulcan Iron Works ... 232

Walworth Co. ... 224
Wedge-Wire Corp. ... 188
Western Machinery Co. ... 181
Western Precipitation Corp. ... 217
Western Rock Bit Mfg. Co. ... 234
Wheel Trueing Tool Co. ... 46
Wild Surveying Instruments, H. ... 41
Wilfley & Sons Co., A. R. ... 66

Yuba Mfg. Co. ... 172

PROFESSIONAL SERVICES ... 254

SEARCHLIGHT SECTION

(Classified Advertising)

H. E. Hilty, Mgr.

EMPLOYMENT
- Positions Vacant ... 256
- Positions Wanted ... 256

SPECIAL SERVICES ... 259

BUSINESS OPPORTUNITIES
- Offered ... 256

PROPERTY
- Wanted ... 256

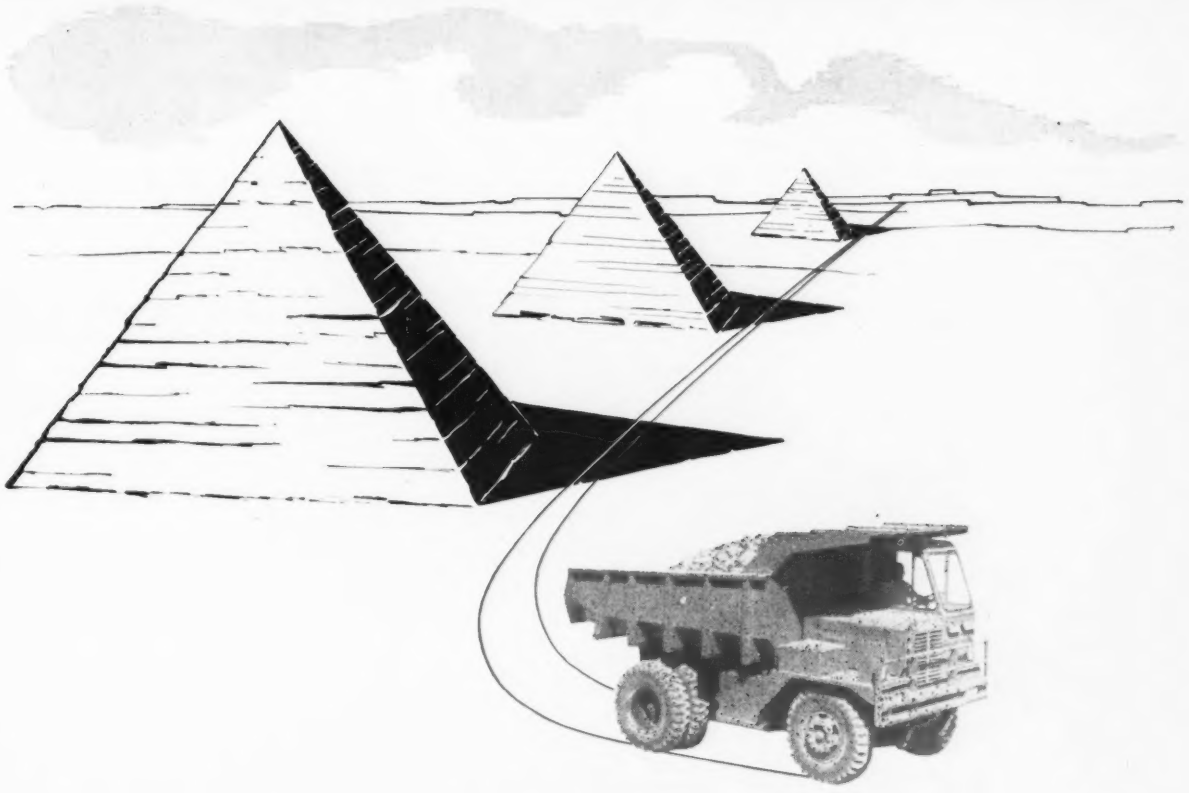
EQUIPMENT
(Used or Surplus New)
- For Sale ... 257-256

WANTED
- Equipment ... 257
- Miscellaneous ... 256

ADVERTISERS INDEX

Albert Pipe Supply Co., Inc. ... 257
American Air Compressor Corp. ... 259
Brassert & Co., H. A. ... 257
Carlyle Rubber Co. ... 259
Darien Corp. ... 259
Electric Equipment Co. ... 259
Florence Machy. & Supply Co. ... 259
Fogelman, Julius M. ... 259
Heineken, Inc., W. P. ... 259
Kirk Co., Wallace F. ... 259
Lefton Industrial Co. ... 258
Machinery Center, Inc. ... 258
Morse Bros. Machy. Co. ... 257
O'Neill, A. J. ... 258
Remmert-Werner, Inc. ... 256
Schoonmaker & Co., A. G. ... 257, 259
Smith Co., H. Y. ... 259
Smith, Paul F. ... 259
Sonken-Galamba Corp. ... 259
Stanhope, Inc., R. C. ... 259
Tarlton Contracting Co., G. L. ... 258
United Mining & Metals Corp. ... 256
Universal Wire & Cable Co. ... 258
Vulcan Detinning Co., The ... 258

United Mining & Metals Corp. ... 256
Universal Wire & Cable Co. ... 258
Vulcan Detinning Co., The ... 258



The Pharaohs would have loved it!

In the great pyramid of Cheops (built around 5000 years ago) there's enough material to build a rock wall all around the country of France. Imagine what Cheops would have done for some of today's modern equipment!

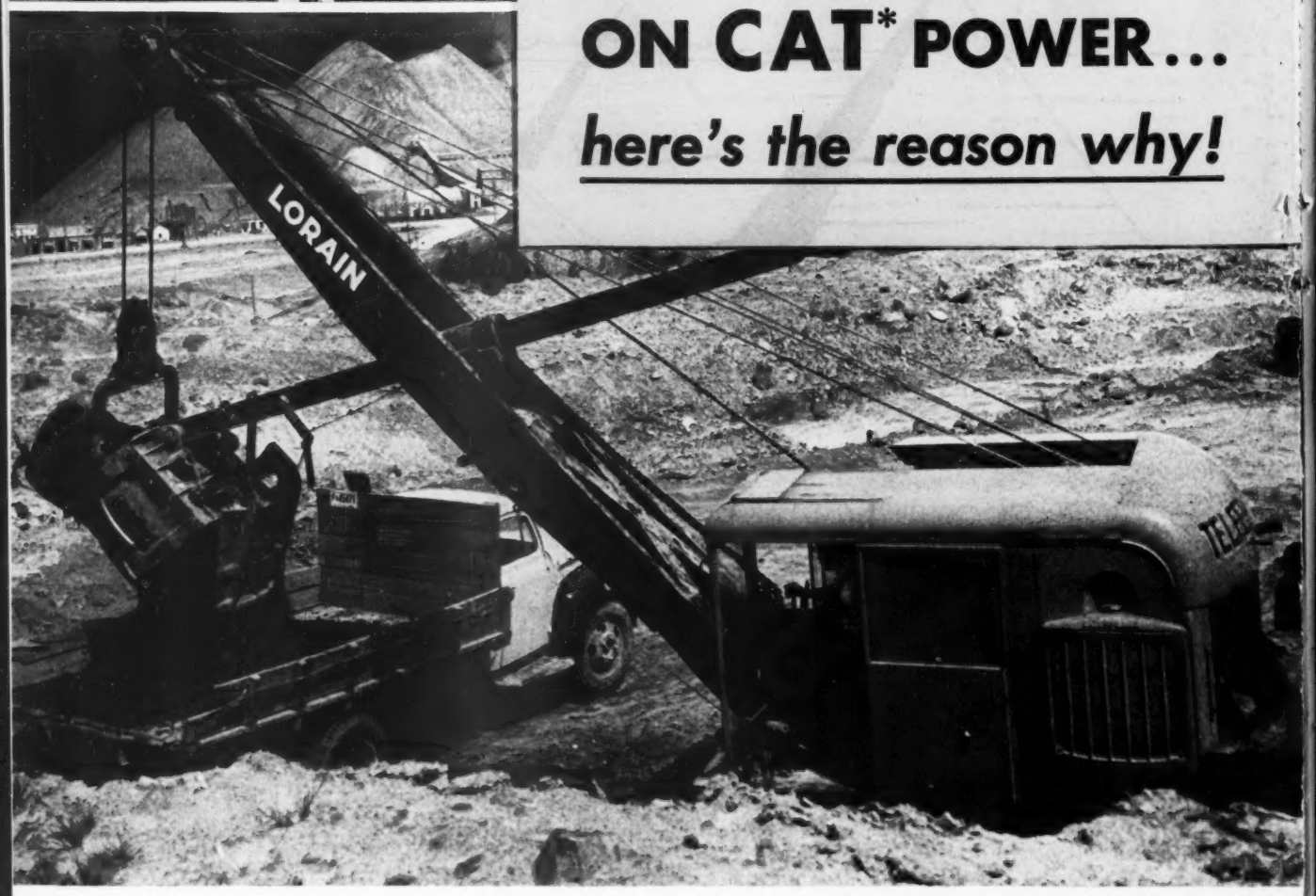
During 51 years of truck-building experience, DART'S newest 10-tonner is truly a giant in its class! It possesses a combination of engineering features unheard of until now—long, low stressed, 2-stage springs, front and rear, for proper shock absorbing qualities, loaded or unloaded; short wheel base (it turns in a radius less than 20'); interchangeable tires all around; improved driver visibility and plenty of power for the toughest operations (156 H.P. Diesel).

Your operation may not be the building of pyramids (481 ft. high) but whatever conditions you face, no matter how rugged they are, the new DART 10-S can meet your requirements of service, economy and low initial cost.

For price and complete specifications on DART TRUCKS, see your local dealer, or write to DART TRUCK COMPANY. Models from 10 to 75 ton capacity.

DART TRUCKS
Kansas City 8 Missouri
SUBSIDIARY OF THE CARLISLE CORPORATION

Mr. Telfer plans to STANDARDIZE ON CAT* POWER... *here's the reason why!*



THROUGH heavy dust and the extreme swing of Canadian seasons, the Caterpillar D318 Engine in this one-yard Lorain shovel delivers steady production for the Telfer Construction Co., Ltd., Montreal. Here you see it stripping overburden in an asbestos mine at Black Lake, Quebec.

The unit loads a four-yard truck every 65 seconds, 10 hours a day, five days a week. It works all year round. Based on 4100 hours' experience with this economical, fast-working engine, Mr. S. Telfer, president of the firm, says: "We're planning to standardize on Caterpillar equipment. Our dealer gives us good service, and we have no complaints."

Like Mr. Telfer, many veteran mining men find that it pays to standardize on long-wearing Caterpillar Engines. Thanks to their exclusive fuel injection system, all Cat Engines can deliver full and foul-free power on low-price No. 2 furnace oil. This cuts costs four ways: cheaper fuel, less of it, reduced maintenance and less down time. Standardization pays off, too, in increased operator familiarity and ease of maintenance. And also in one *dependable* source for fast service and genuine parts—your nearby Caterpillar Dealer.

There are 12 Caterpillar Engines and Electric Sets, to 500 HP and 315 KW. Your Caterpillar Dealer will help you select the power unit that fits your needs. Be sure to see him before you repower. And specify Caterpillar power when you order new equipment—more than 150 manufacturers can supply it in their machines!

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

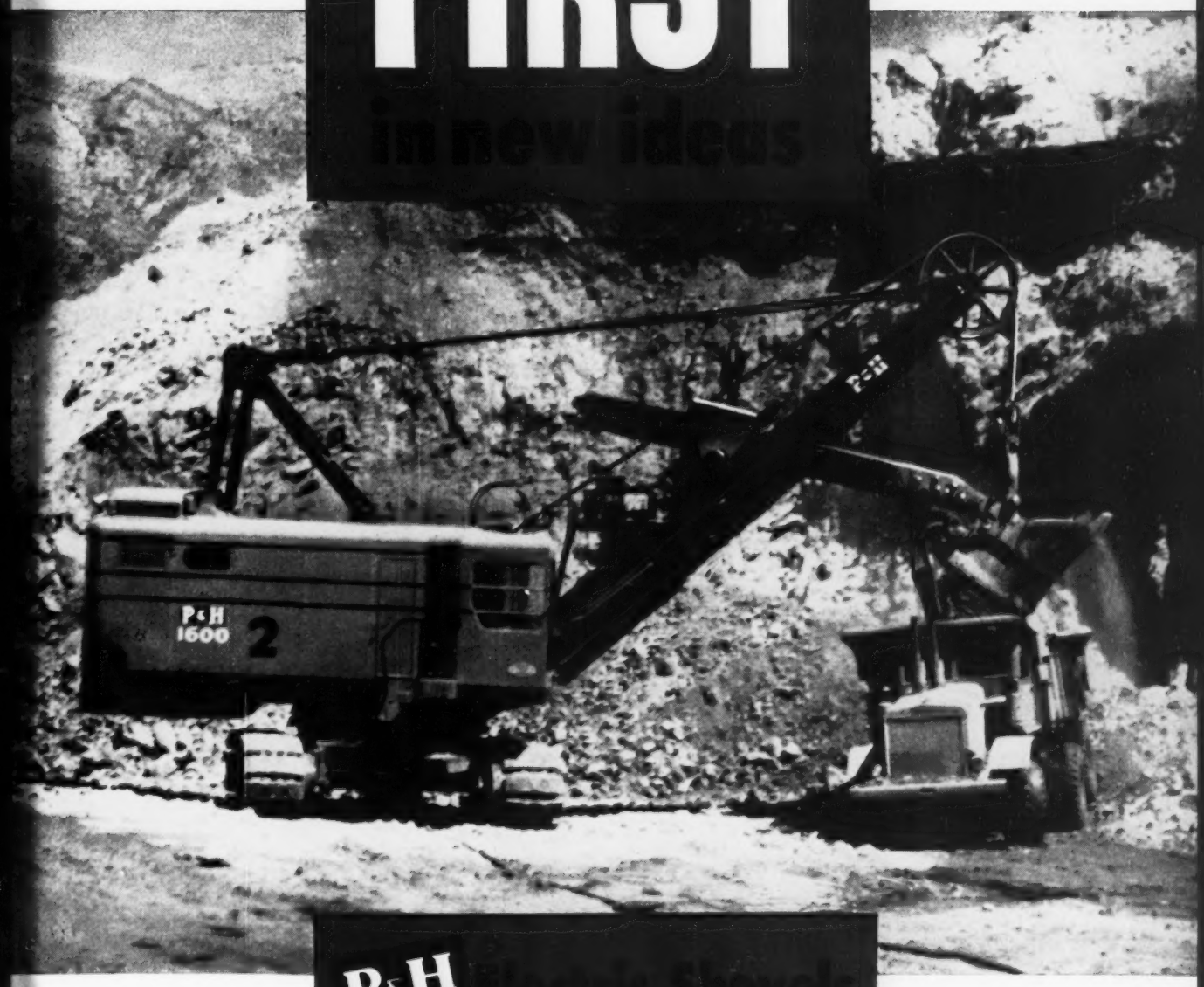
CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®

A WORD TO THE WISE— STANDARDIZE!

FIRST

in new ideas



P&H Electric Shovels

The first thing you see when you look into P&H Electric Shovels is new ideas—ways of doing things differently. *Differently and better!* For P&H engineering concentrates on one thing . . . cutting *your* production costs!

The result is evident in electrical equipment designed and built by P&H—especially for the purpose—not adapted for it. Stepless power regulation gives you the smoother flow of power without multiple contactors to cause trouble and replacements. There's Magnetorque* Hoist Drive, vertical swing motors, independent propel, powerful worm crowding mechanism with separate crowd motor, air-filtered cab. And there's the all-welded strength of rolled alloy steels to take year-in, year-out punishment.

P&H leadership in electric shovel development gives you leadership in all kinds of open pit work . . . lower tonnage costs! That explains why every third P&H Electric Shovel sold is a repeat order. Get the facts.

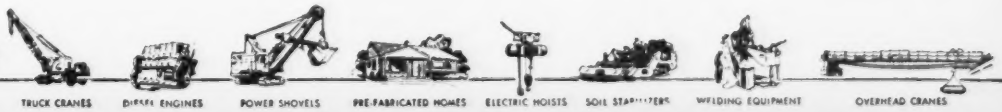
**T. M. of Harnischfeger Corporation for electro-magnetic type coupling.*

P&H LARGE EXCAVATOR DIVISION

HARNISCHFEGER CORPORATION

MILWAUKEE 46, WISCONSIN

the P&H *Line*



Dumps on the go, TIMKEN® bearings keep it on the go

AS this Sanford-Day drop bottom mine car rolls over the surge bins, its doors open, dump the load, close automatically. A unique tripping device insures precise dumping.

To keep these mine cars on the go with minimum time out for maintenance, Sanford-Day engineers specified that these wheels be mounted on Timken® tapered roller bearings.

Line contact between rollers and races gives Timken bearings enormous load-carrying capacity—exactly what is needed for rugged mine car service.

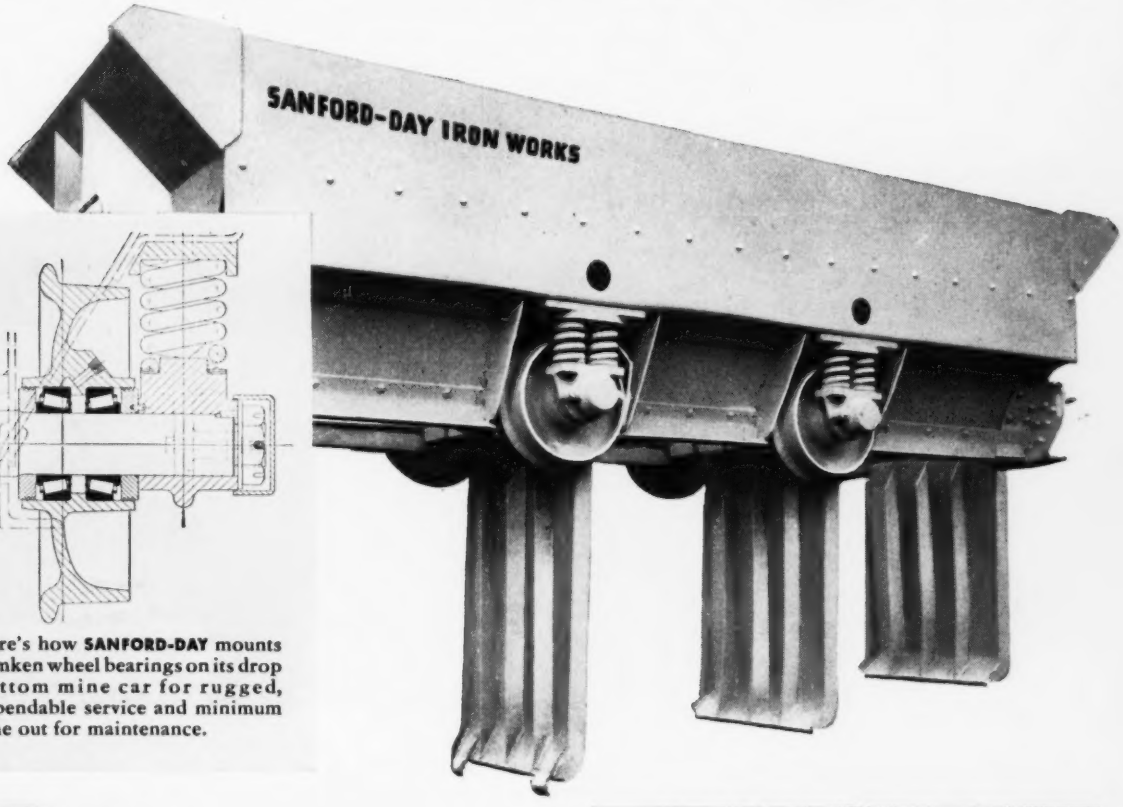
And tapered design permits Timken bearings to take radial and thrust loads in any combination—eliminating the need for extra thrust bearings or plates.

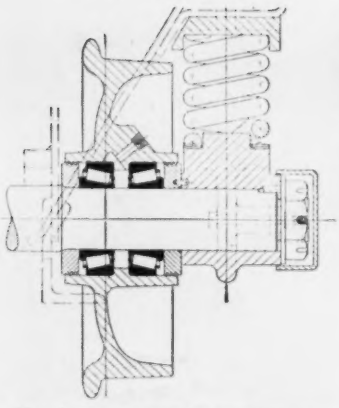
Timken bearings allow easier starts and longer train lengths because their true rolling motion and smooth surface finish reduce friction to a minimum.

Because Timken bearings keep housings and shafts concentric, closures are more effective. Dirt, dust and moisture are kept out, lubricant is kept in, reducing wear and maintenance.

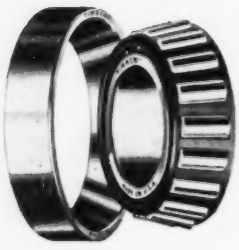
Specify Timken bearings on mine cars you build or buy and assure yourself of all these cost-saving advantages. Call in our mine car experts today and let them show you how your hauling costs can be cut. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best





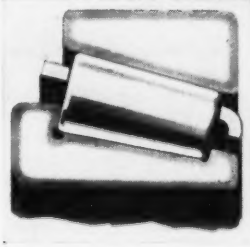
Here's how **SANFORD-DAY** mounts Timken wheel bearings on its drop bottom mine car for rugged, dependable service and minimum time out for maintenance.



TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



HARD ON THE OUTSIDE, TOUGH ON THE INSIDE

Rollers and races of Timken bearings are case-carburized to give a hard, wear-resisting surface and a tough, shock-resisting core. Result: longer bearing life.

The Timken Company leads in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis Timken steels.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ↕ AND THRUST →○← LOADS OR ANY COMBINATION ✳